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CALIFORNIA
OIL WORLD
and Petroleum Industry

ICE MONTHLY
ARCH 20,
1938

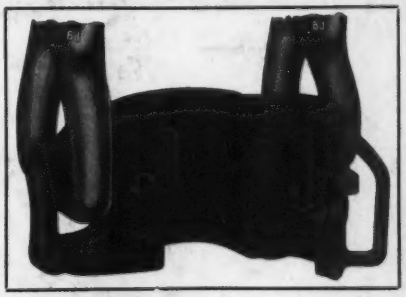
Vol. 31
No. 6
Whole
No. 1509

IT'S BJ AGAIN

. . . with a combination Rotary and Casing tong that is fast and safe in action and has all the strength needed for handling large diameter tool joints and for breaking-down or making-up drill collars, core barrels and reamer subs. It's the Extra Heavy Type, in all API sizes from 2⅞" to 16", and the size you need is ready for prompt delivery.

IT'S BJ AGAIN

. . . with a roller which passes over a "hump" raising and lowering the Type D Elevator Door as it is opened or closed. The force of the pipe striking against a closing finger closes the door into position where the weight of the string will complete the closing and latching.



When the bevelled surface "B" on the door interlocks with the body at "A"—no load is placed upon the latch.

BYRON JACKSON CO.
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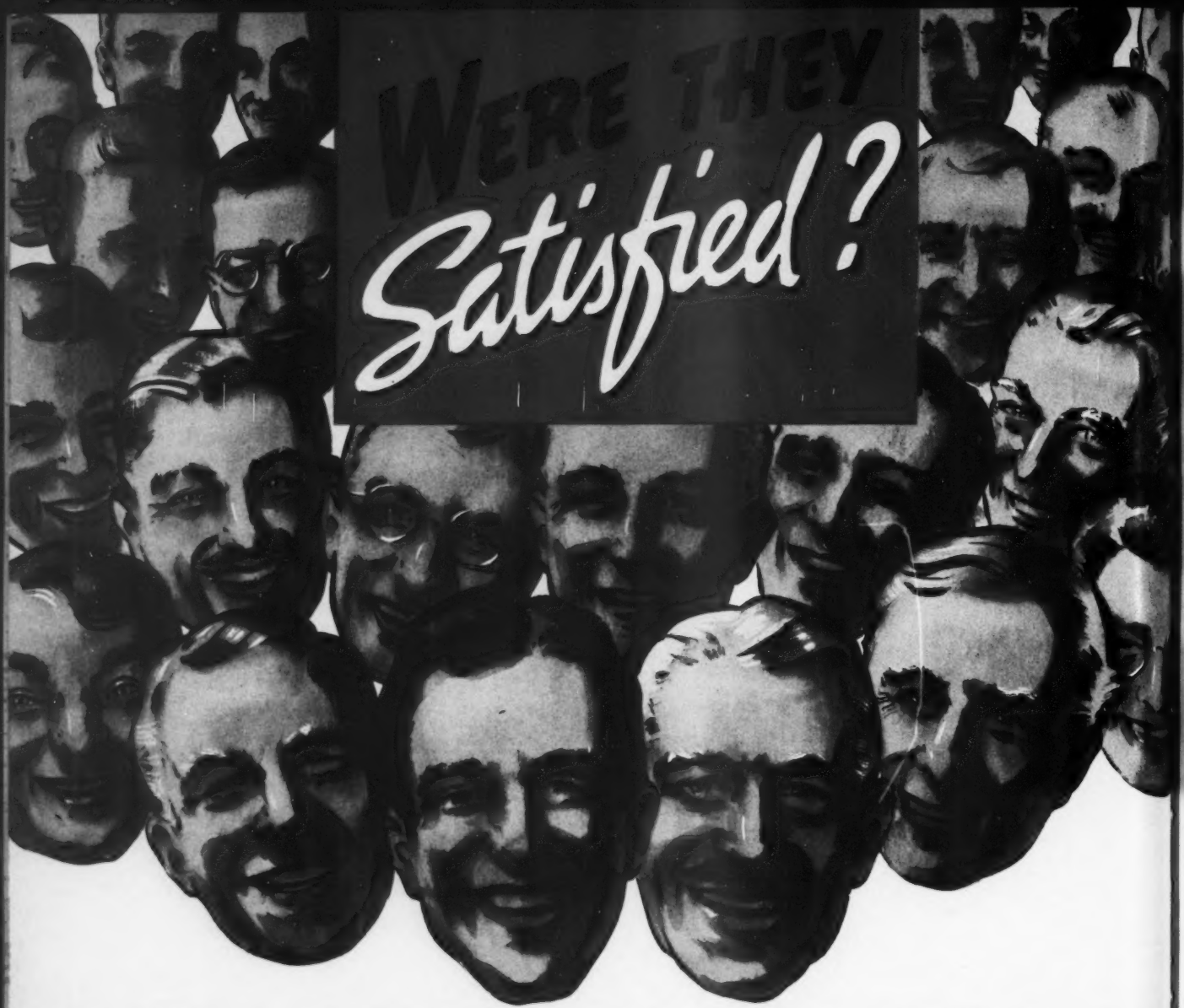
BJ TONGS AND ELEVATORS



Few indeed are the oil well operators who are dissatisfied when Lane-Wells does the perforating job. Why? Because at every step in equipment design and manufacture—in every phase of field service, customer consideration is paramount.

The efficiency, the safety, and the positiveness of Lane-Wells equipment is universally recognized. Lane-Wells crews are trained to get on and off the rig with the maximum speed possible. Every effort is made to reduce "shut down" time consistent with doing a perfect job.

Each member of the Lane-Wells organization recognizes that satisfied customers are the life blood of a business.

Whatever progressive development Lane-Wells engineers have made—whatever the company has accomplished of technical interest to the oil industry—it has been with customers' cooperation.

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Tomorrow's Tools Today

Perforating in Open Hole

The Lane-Wells Gun Perforators are designed for standardized casing sizes. The smaller guns fire twelve and the larger guns ten shots. These shots are fired separately, in order that the perforations can be spaced in accordance with engineers' specifications.

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Lane-Wells Offers Complete Directional Drilling Service

Trained and experienced field crews equipped with Lane-Wells Knuckle Joints and Whipstocks are prepared to change the direction of a well or incline a hole so that it will reach any predetermined point.

CALIFORNIA
OIL WORLD
and Petroleum Industry

THE AUTHORITY ON THE CALIFORNIA OIL INDUSTRY

MARCH 20, 1938
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The California Oil World's Series of Articles on the Beginning and Development of the Oil Companies Making Up the California Petroleum Industry Will Be Continued in an Early Issue.

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W. E. AUSTIN, Manager, California Oil World News Service

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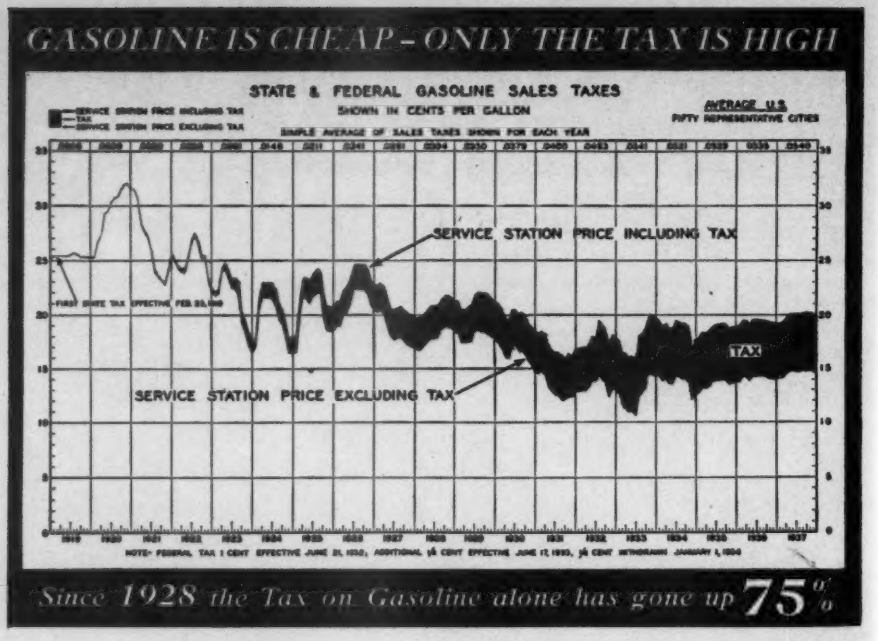

GASOLINE IS CHEAP - ONLY THE TAX IS HIGH
STATE & FEDERAL GASOLINE SALES TAXES
SHOWN IN CENTS PER GALLON
AVERAGE U.S. FIFTY REPRESENTATIVE CITIES
SERVICE STATION PRICE INCLUDING TAX
TAX
SERVICE STATION PRICE EXCLUDING TAX
Since 1928 the Tax on Gasoline alone has gone up 75%

The chart at right shows the progressive increases in gasoline taxes from the year 1919 to December 1, 1937. The prices used are the average prices for these years in 50 representative cities throughout the country.

WHAT THE INDUSTRY HAS

FOR THE CONSUMER:

Gasoline is today the cheapest commodity in general use.

In 1920, the average service station price of gasoline, ex-tax, was . . . . . 29.74 cents

On Dec. 1, 1937, the average service station price of gasoline, ex-tax, was . . . . . 14.41 cents

In 1926, the average service station price of gasoline, ex-tax, was . . . . . 20.97 cents

as compared with the Dec. 1, 1937, average service station price of . . . . . 14.41 cents

Therefore, the average service station price of gasoline today, ex-tax, is approximately 48% of what it was in 1920, and approximately 69% of what it was in 1926.

The consumer is being furnished a much better product than he was receiving in either 1920 or 1926, and, in addition, is getting much better service in the distribution of petroleum products.

Gasoline prices, excluding taxes, have shown, since 1920, an almost continual downward trend.

FOR LABOR:

(1) Labor rates generally are higher in the petroleum industry than in any other major industry in the country.

(2) Labor in the petroleum industry enjoys hours of work about as short as in any other major industry. In 1937, payrolls in the petroleum industry will probably exceed the peak year of 1929.

(3) The petroleum industry is giving employment to more than a million men. It has been a pioneer in the shorter work week and is in the forefront of progressive industries in wages, hours, and conditions of employment.

(4) The industry has a notable record for human safety in all its operations.

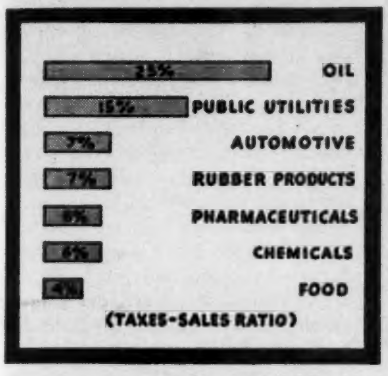
TEXACO

THE TEXAS COMPANY

Petroleum the most taxed of all industries

A study completed by the National Association of Manufacturers shows that taxes on petroleum products and operations were almost twice as burdensome as the taxes on public utilities; almost four times the taxes on the automotive and rubber industries; and over six times greater than taxes levied on the food industry.

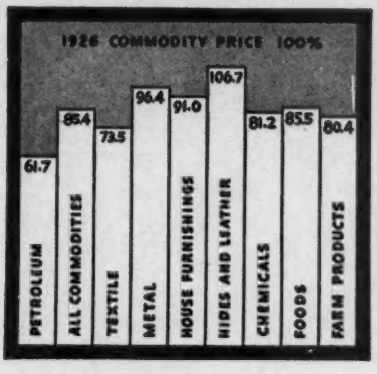
Taxes on petroleum products amount to *11% of ALL Federal, State, and local taxes.*



Wholesale prices of petroleum products show a greater reduction than those of any other commodity

Compared with the commodities listed below, petroleum products show a 38.3% reduction in price since 1926—being now only 61.7% of that year's level. No other of these commodities has been reduced so low in price or is taxed so high.

The chart below, comparing the commodity prices of 1926 with those of today, is based on data published by the United States Department of Labor.



PETROLEUM ACCOMPLISHED

FOR GOVERNMENT:

The petroleum industry has been actively cooperating with representatives of both the Federal and State governments in conserving the great natural resources—petroleum and gas—with which it deals.

The representatives of the industry have been actively advocating for years the passage of conservation legislation by both the State and Federal governments. It has actively supported the organization of the Interstate Compact to Conserve Oil and Gas, which deals with the conservation of both petroleum and gas.

FOR STOCKHOLDERS:

Stockholders in petroleum companies have had only a modest return on their investment since 1920.

In fact, the annual average for the years 1921 to 1936 shows a return of 1.35% on the annual average investment of eleven billion dollars. The annual average per cent of tax on this investment is approximately 5.34%.

FOR TAXES:

Taxes paid by and through the petroleum industry to the State and Federal governments exceed those from any other industry in the United States. Although crude petroleum is selling at an estimated average price of $1.18 per barrel, taxes have been estimated to equal a total of approximately $1.14 per barrel of crude oil produced.

The petroleum industry remits to Federal, State and other governmental bodies approximately 205 different taxes.

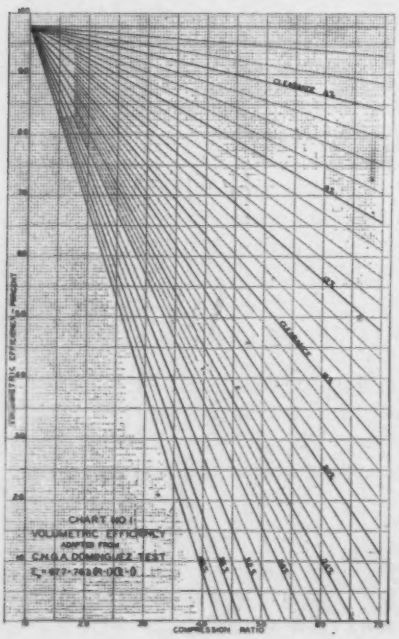
135 East 42nd Street, New York, N. Y.

Load Control By Clearance

By T. Hume West, Assistant Chief Engineer
Industrial Fuel Supply Co.

Compressor cylinders for gas compressor plants are usually chosen with some definite range of intake and discharge pressures in mind. Sometimes later it may be desired to change these pressures beyond this original range, with a resulting increase of horsepower per cylinder beyond the limit of the engine. In this case we either have to buy new cylinders to fit the new pressures, or find some means of unloading the cylinders to a point within the horsepower of the engine. With new cylinders costing several hundred dollars each, a method of unloading the old cylinder at a nominal cost is a happy solution of the problem, especially when the new pressure range may be of only a temporary nature. This unloading can be done by increasing the clearance, and we hope the following explanation will be of value both for determining the proper cylinder size and for unloading cylinders by clearance pockets.

First, let us see the effect of clearance on volumetric efficiency. At the end of the piston stroke, the clearance space is filled with gas at the discharge pressure, which, on the intake stroke, must expand and reduce its pressure to that of the intake before the intake valve will open. This delay in opening naturally reduces the quantity of gas taken in to less than that of a full stroke, or in other words, reduces the volumetric efficiency. It will be seen that this delay is prolonged by two factors: clearance, by increasing the quantity of gas to be expanded, and ratio, by increasing the pressure range through which the gas must expand. This effect is shown graphically on the accompanying chart No. 1, adapted from data compiled by the C. N. G. A. Gas Engine and Compressor Committee from actual tests. By following any ratio line down the



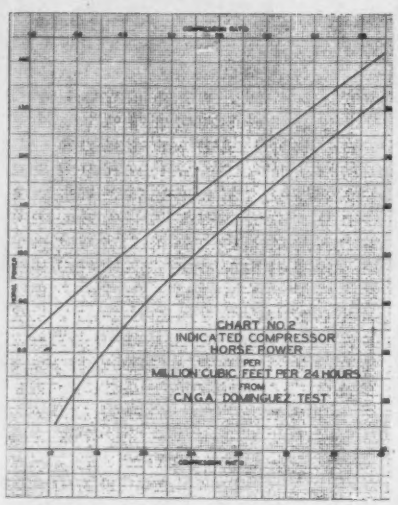


chart we see that each increase in clearance decreases the volumetric efficiency, and by following any clearance line across the chart, that an increased ratio likewise decreases the volumetric efficiency. Therefore, from this chart we can determine the volumetric efficiency under any given conditions, and by applying this efficiency E_v to the displacement D of the cylinder, in cubic feet per minute, at the absolute intake pressure P_1, we can calculate the quantity of gas it will pump per day under the given conditions by the following formula, Q being millions of cubic feet:

$$Q = \frac{D\ E_v\ P_1}{10220}$$

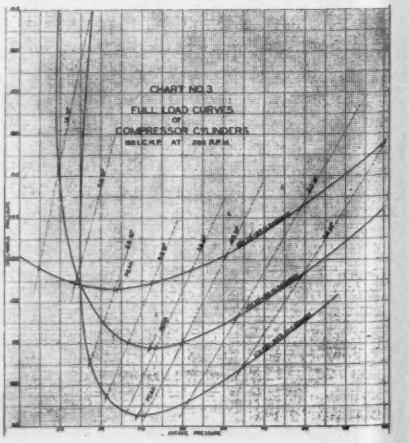
From a gas handbook, or from the accompanying Chart No. 2, also made from data compiled by the C.N.G.A. Committee, we can secure the indicated compressor horsepower required to pump a million feet of gas through a given ratio. We should know from the manufacturer's data or from actual indicator tests that with a certain combination of engine and compressor we will have a definite horsepower available at the compressor cylinder. By dividing this horsepower by the horsepower per million at the given ratio, we obtain the capacity of the compressor in millions of cubic feet. Now our problem is to choose our cylinders to fit this capacity, or if we already have the cylinders, to see if we can change the clearance to adapt them to this capacity.

To illustrate this let us take a problem and work it out. Assume that we have a two cylinder compressor with 150 h.p. available in the compressor cylinders, and that we wish to pump gas from 25 lbs. gauge intake to 125 lbs. gauge discharge, or through a compressor ratio of 3½. First, we find on Chart No. 2 that 73.2 h.p. are required to pump each million feet of gas through a ratio of 3½. Dividing our 150 available horsepower by this shows that we can pump 2.05 M² cu. ft. per day with this horsepower. To find our cylinder size let us assume first a cylinder with a reasonably small clearance, such as 2%, so that we will have the widest range through which to increase the clearance and thereby unload the cylinders, if we should so desire in the future. A ratio of 3½ on Chart No. 1 gives us a volumetric efficiency of 95.7%. Therefore, the displacement of both cylinders together must be

$$D = \frac{10220 \quad 2.05}{.957 \times 40} = 548 \text{ cu. ft./min}$$

or one-half of this for each cylinder. Then we find that an 8¾" x 20" cylinder at 200 R. P. M. has approximately this displacement. If we were buying new cylinders, then this would be the size and clearance required to balance against our available 150 H. P.

Suppose, however, we have idle spare cylinders on hand in the 10" x 20" and 11" x 20" sizes. Could we change these to fit this service? The displacement of two 10" x 20" cylinders is 708 cu. ft. per min. However, our capacity is limited by the horsepower available to 531

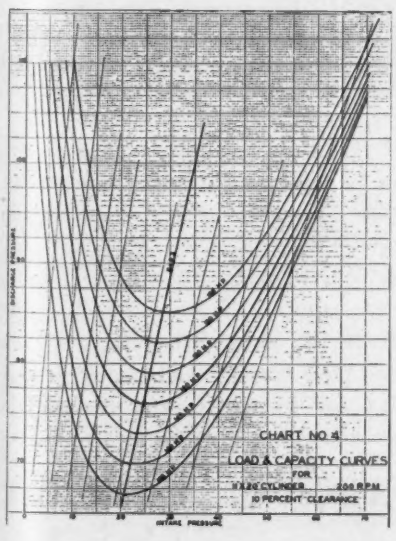


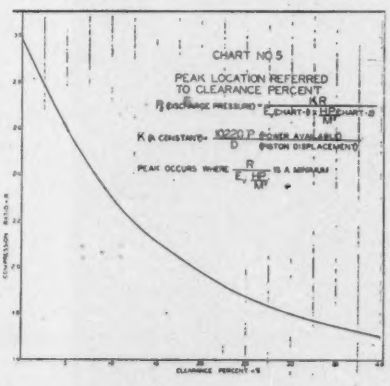
cu. ft. per min., which is only 75% of this displacement. Therefore, this 75% must be our volumetric efficiency to restrict the horsepower to that available. Chart No. 1 shows at a ratio of 3½ that a clearance of 13% gives this volumetric efficiency, so our clearance must be increased to this amount. Following the same procedure on the 11" x 20" cylinders with their displacement of 862 cu. ft. per min., we find that the capacity is 61.5% of this, and that a clearance of 20% is necessary to give this volumetric efficiency.

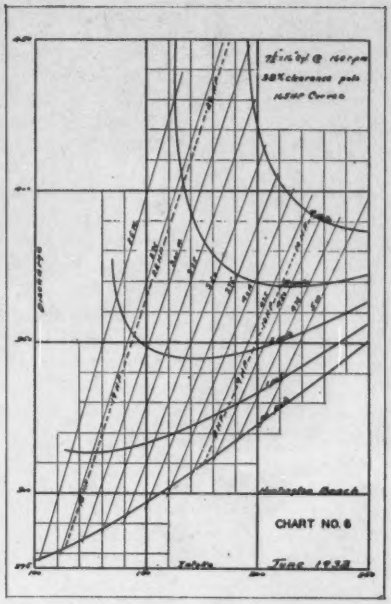
Now to increase the clearance on these: First, we must know the normal clearance, either from the factory, probably expressed as a per cent., or from actual measurement, perhaps by measuring the volume of water required to fill the clearance space with the piston set at the end of the stroke. This volume, in cubic inches, divided by the single stroke displacement, that is, piston area times the stroke, also in cubic inches, gives the per cent of clearance. Suppose in the 10" x 20" cylinder this is 2% and we need 13% to unload it. Then the increased clearance required is the difference between these two, — 11% of the single stroke displacement, or 210 cu. inches should be added to each end. Most compressor cylinders, at least those of recent date, have an opening into the compression chamber, ordinarily closed with a pipe plug. If we simply replace this plug with a pocket of the right volume, in this case 210 cu. inches, made of a short nipple on a pipe capped on each end, or perhaps on two welding caps welded together as a sphere, we than have the required additional clearance. The same thing can be done for the 11" x 20" cylinders, increasing the size of the pockets in the proper amount to fit the required per cent. of clearance and the larger displacement. These clearance pockets simply act as reservoirs in and out of which the gas surges on the discharge and intake strokes, thus delaying the opening of the intake valves and thereby lowering the volumetric efficiency, as explained above. By inserting a valve between the cylinder and the pocket, the clearance can be controlled at will, the value of which will be shown later. Since the piston rod generally makes the clearance of the frame end different from that of the head end, the clearance and the pockets should be calculated separately for the two ends, especially on small bore cylinders.

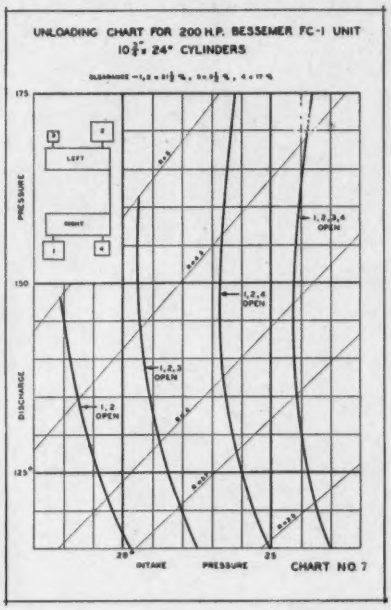
Suppose now we calculate the performance, plot the curves, and compare these three cylinders at different pressures and ratios, but always at the full load of 150 I. C. H. P. For this we first choose a series of ratios, say from 1½ to 7 in ½ ratio steps, and from Chart No. 2 find the horsepower per million for each of these. From our preceding calculations we know the clearance of each of the cylinders, so taking them one at a time we read from that clearance line on Chart No. 1, the volumetric efficiency at each of our chosen ratios. Since from our quantity formula given previously, we can solve for P_1 if the quantity and other factors are known, we now do this, substituting the proper value of E_v and quantity for each ratio. Multiplying each intake by its corresponding ratio gives the discharge, and repeating this process for each cylinder and then plotting the discharge against the intake gives us three curves such as shown on Chart No. 3.

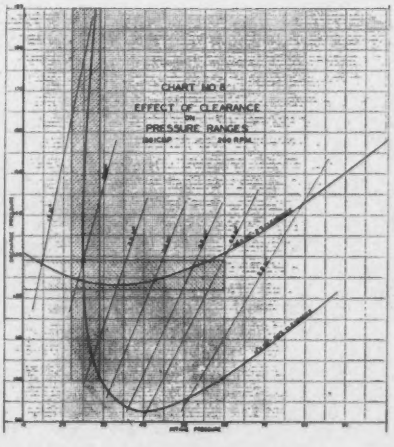
Each of these curves indicates the various intake and discharge pressures at which that cylinder may operate at the full load of 150 I. C. H. P., and the straight lines radiating from the lower left are constant ratio and also constant volume lines through the different pressures. Remembering that the original problem was to find cylinders that would operate under the given conditions of











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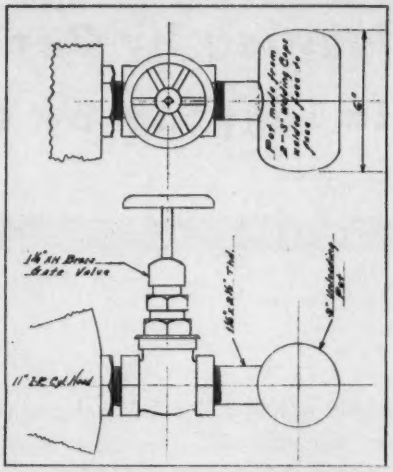
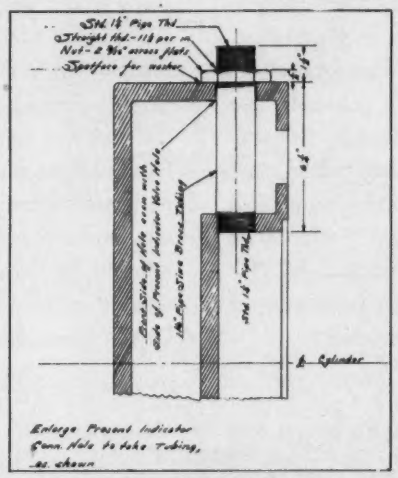
25 lb. intake and 125 lb. discharge, we see that the three curves cross at 25 lbs. intake and 124 lbs. discharge, missing the desired point only 1 pound, and showing that any one of the three cylinders would be suitable for these given conditions. However, they would not be suitable for any other conditions of intake and discharge at the same horsepower unless those conditions fell on the load curve for that particular cylinder. Also, at any other points on the curves the volumes pumped by the three cylinders are not the same except at points on the same quantity line, and therefore, at different pressures. Any other conditions of intake and discharge falling to the upper right of these curves indicate progressively higher horsepowers or overloads, while those falling to the lower left indicate progressively lower horsepowers or underloads.

This feature of these curves can be illustrated interestingly and sometimes very usefully in the following manner: Let us take a 10" x 20" cylinder with 10% clearance as an example and calculate a series of load curves for it, substituting horsepowers ranging from 135 to 165 in 5 H. P. steps, as well as the 150 full load horsepower previously used. If we plot these curves and draw in the ratio lines as before; we find that we have a series of similar, but not identical curves, such as shown on Chart No. 4. The horsepower loads at the various intake and discharge pressures can then be seen to increase progressively, starting in the lower left area and extending across the full load curve to the upper right area. These charts are very useful for quickly finding the I. C. H. P. at any time, by simply noting the intake and discharge pressures and reading the corresponding horsepower from such a chart.

A question that is often discussed is that of where the power peak is located, or **that point of lowest discharge pressure that requires full load horsepower.** It can be seen from the curve on Chart No. 3 that the peaks for the three different cylinders occur neither at the same intake, the same discharge, nor the same ratio. However, on Chart No. 4, showing the load curves of one cylinder at a fixed clearance, it is seen that all the peaks at the different pressures do occur on the same ratio line. Therefore, these charts show that, contrary to popular belief, the peak does not always occur at the same ratio in different cylinders, unless the clearances are the same. This effect of clearance changing the ratio of the peak horsepower can be calculated and the result plotted as shown on Chart No. 5, the formula for the calculation being shown on the chart. This chart shows that as the clearance increases the compression ratio of the peak horsepower decreases. The popular idea that peak horsepower always occurs at the same ratio in all cylinders probably was derived from familiarity only with cylinders having nearly the same clearance.

Reference was made previously to the use of valves inserted between the clearance pockets and the cylinders for concontrolling the clearance at will. Since on a two cylinder, double-acting compressor there are four clearance pockets, we can, by opening the pockets one at a time, have five steps of clearance, ranging from no pockets to all pockets open. In calculating the compressor load we must, of course, calculate the horsepower on each end of the cylinder



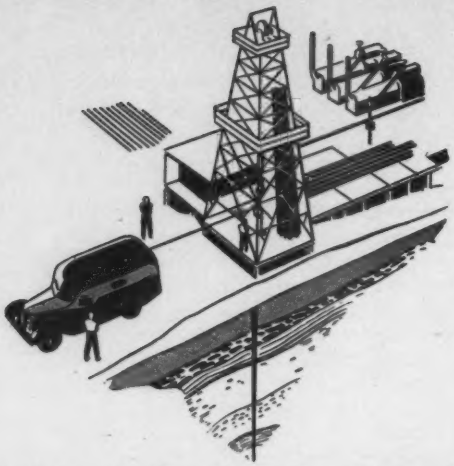


with the pocket first closed and then opened. Then by adding together the various possible combinations of these, we can secure the total horsepower of any one of the five steps. By plotting these as before we secure a set of curves such as those shown on Chart No. 6. This chart was made about six years ago for actual use in a plant in which the intake varied from 110 to 225 lbs. and the discharge from 300 to 400 lbs. The cylinders used were 7½" x 16" Ingersoll-Rand, with 38% clearance pockets added to the 8% normal clearance in the cylinders. By means of this chart the plant operator has been able to maintain his compressors at almost constant full load regardless of the pressures, simply by consulting the chart and opening the number of pockets shown on the curve nearest the intake and discharge pressures.

Another example of this is shown on Chart No. 7. In this case the ratios and discharge pressures were so far above the normal operating range of the cylinders that operation with no clearance pockets open was impossible. Consequently different sized pockets were used and different combinations of these gave the four quite evenly spaced steps shown. Of course, several more combinations are possible, in fact, about sixteen with the proper size pockets, but these four covered the desired range.

If we refer again to Chart No. 3 and analyze the two outer curves, we can see that they have quite different characteristics which might make them valuable for different purposes. For example, if we were pumping from the wells into an absorption plant our discharge might be fairly constant while the intake varied radically. In this case, if we chose the 8¾" x 20" cylinders with small clearance, our pressures could vary anywhere within the shaded portion around that curve on Chart No. 8, and still be reasonably close to full load. On the other hand, if we were pumping out of an absorption plant into a transmission line, the reverse might be the condition, with constant intake and variable discharge. In this case, if we chose the 11" x 20" cylinders and raised the clearance to 20%, our pressures could vary anywhere within the shaded portion on that curve without being too far from full load. Thus we see that although either cylinder would be suitable for the same conditions within a limited range; that is, where the shaded areas and curves cross each other, outside of that area their characteristics are so opposite that each one is entirely unsuited for the operating conditions of the other.

It is such cases as those just given that show the value of knowing the clearance of our cylinders. Not only does this knowledge enable us to choose the best size of cylinders in the first place, but also to control the load by means of clearance pockets if the conditions change, or to adapt other cylinders to that service, and thus perhaps save the cost of new cylinders.



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Today electric logging in California is far superior in service, equipment, and personnel to that of any other place in the world. In the development of these improvements, Geoanalyzer has played a most important part. It has done much to bring this new era to electric logging. Not a small factor in the building of Geoanalyzer service is the location of Geoanalyzer's headquarters and home office in California, with its only interest the serving of this territory with the finest equipment and most efficient staff. Learn why electric logging by Geoanalyzer is such a vital part of the drilling operation of leading California oil companies. On your next job of electric logging, call Geoanalyzer.

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Recent Long Beach Harbor Developments

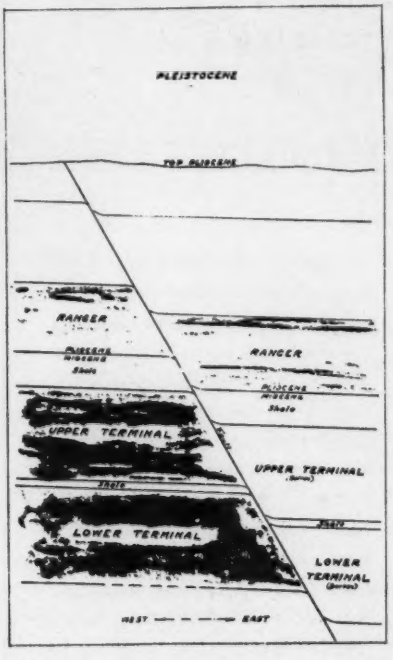
By B. A. Grasser
Consulting Petroleum Engineer

AT the last meeting of the Los Angeles Chapter of the American Petroleum Institute, Mr. Carrey told of the good oil sands being then cored in Superior Oil Co. well No. 1960 Community 1 and in the General Petroleum Corp. and Bankline Oil Co. wells in the near vicinity. This was prior to completion of any wells in the Long Beach Harbor area of the Wilmington oil field. At the same time he told of gray sands being cored in the Terminal Zone in General Petroleum Corp. Blinn 1 and Channel Community 3 and in Allied Petroleum Co. well No. 23. At that time a fault was known to exist in the Harbor area but the exact location had not been determined. It was thought that the fractured condition of the cores in Allied Petroleum Co. well No. 23 indicated that it had passed through a fault. Subsequent comparison of electrical logs shows that Allied Petroleum Co. well No. 23 has a normal section and the fault lies several blocks to the west. At this time I might add that the gray sand in General Petroleum Corp. Blinn 1 and Channel Community 3 was not in the least unexpected as the Terminal Zone in the middle of the field is gray when found at an equivalent depth. It was surprising, however, to find the Terminal Zone gray in Allied Petroleum Co. well No. 23 although the past history of the field should have warned us not to anticipate too much when going from one fault block to another.

Let us briefly review the geology of the field in explanation of the conditions found in the Harbor area. The Wilmington oil field is a complexly faulted anticline with a northwesterly-southeasterly trend lying southeast of and in echelon with the Torrance oil field. The faults are in a general north-south direction with a varying amount of throw. There are probably seven faults which can be located from the missing sections in electrical logs by the breaking of contour lines and by production differences in wells separated by faults. All but two of these faults have the easterly side of the fault normally downthrown from the westerly side and these two are faults with a small throw. Being normal faults, the hade or dip of the faults is to the east.

The amount of throw of any one of these faults depends on the depth, geologically, at which it is measured. The Pleistocene formations extend from or near the surface to 1600 to 1800 feet. During this period there has been no faulting or folding of major importance. The faulting has been traced to the Pliocene age during which the faulting took place in a number of recurring movements or a continued gradual movement. This has been determined by the graduation of the throw of the faults from none at the end of the Pliocene period to its maximum known throw at the beginning of the Pliocene. The difference is made up by a thickening of the strata on the downthrown side of the faults.

The bottom of the Ranger Zone in the Harbor area is at the approximate bottom of the Pliocene. The Miocene lies below the Pliocene and is composed of



a thick shale body followed by the Terminal Zone which is highly productive in the area near the Harbor entrance. The Miocene extends downward to the Basement Schist. (See figure 1.)

Returning to the fault in the Harbor area, we have found that the fault has a throw variously estimated at 140 to 180 feet at the top of the Terminal Zone and a hade to the east of between 28° and 35°, i. e., measured from the vertical. At 2500 feet below sea level the fault goes through General Petroleum Corp. Harbor Community 7, passes just east of Long Beach Harber Oil Co. Cedarholm 1, just west of Hancock Oil Co. Harbor A-2, curves easterly passing almost through General Petroleum Corp. S. P. 2 and some distance to the east of its Blinn 1. The exact direction on the northerly end cannot be determined because no wells have intersected it beyond General Petroleum Corp. S. P. 2 to place it definitely. An offset in the contours however proves that the fault does not extend through the north flank of the field. Since this fault hades to the east and also because no production has been found in the Terminal Zone east of the fault, it is evident that the Terminal Zone will be gradually reduced in that direction by the fault until a location will be reached where there will be no Terminal production. (See Figure 1.) The Ranger Zone only is being produced east of the fault where all of the Terminal Zone is gray.

I mentioned previously that we should not expect too much going from one fault block to another. Normally we probably would expect similar performance of oil sands from one fault block to another if the sands were found at equal depths below sea level. This does not hold true in the Wilmington oil field because the Terminal Block of the General Petroleum Corp. is higher than the Ford block and yet we have no lower Terminal Zone and a poorer Ford Zone in the Terminal block compared to a highly productive Lower Terminal and a good Ford Zone in the Ford block. The source of the oil and the migration along fault planes may later show the reason for this condition. I will not attempt to offer an explanation but will call this condition to your attention.

The shallowest depth of the Terminal Zone yet found in the entire field is at the Harbor entrance. Indications point to the field extending southeasterly under the ocean for some distance. From a geological point of view, the high position of the wells in the Harbor area coupled with the added undrilled drainage area gives ideal conditions for large production. Added to this is the fact that 1000 feet of Terminal Zone and 350 feet of Ranger Zone are found to be highly productive in that portion west of the fault passing through the Harbor area.

The mechanical completion of the wells and the method of producing the wells is perhaps the greatest individual factor in making large wells where, as in this area, the gas pressure is not excessively high.

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On this page diagrams of a few of the casing programs show how, by tubing methods, large production is obtained from wells high in fluid but with moderate pressures. I will omit the surface casing in each case as it is unimportant in this discussion. In order to accomplish the desired casing programs, operators have had to deviate from past practices and develop new methods which have taxed the ingenuity of the engineers, both of the oil companies and the manufacturing companies.

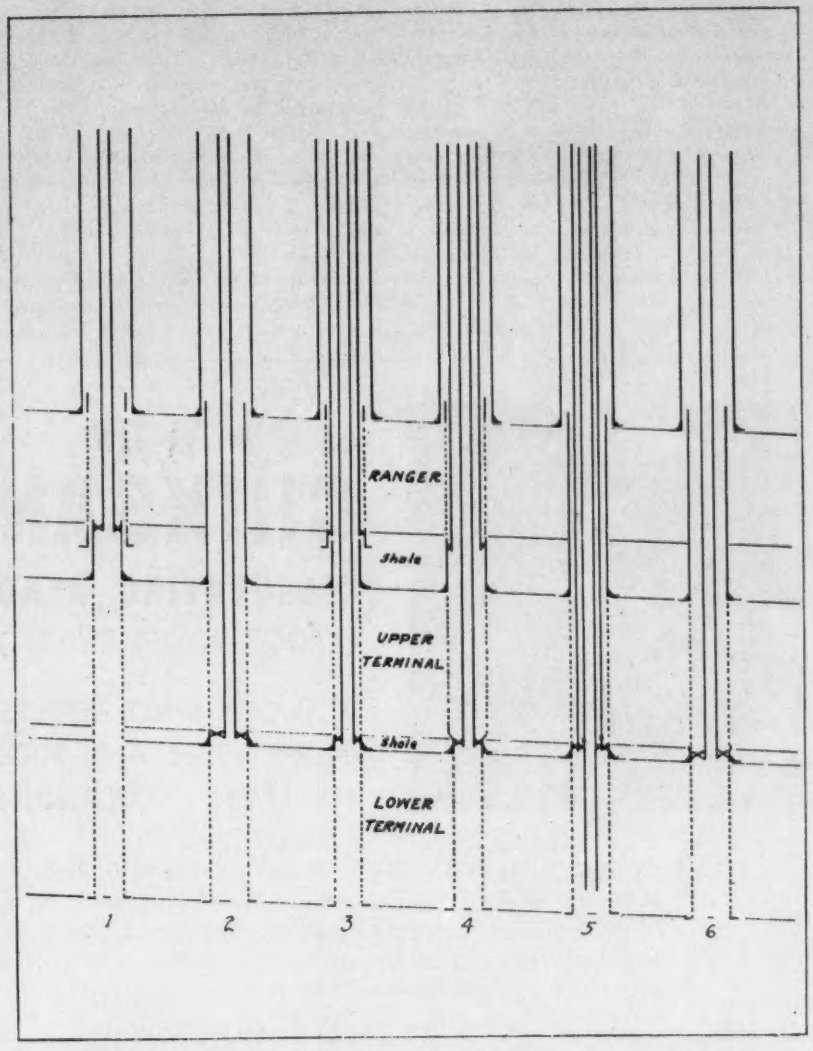


Diagram 1, uses no new methods of cementing. The tubing is landed on a packer in the blank portion of the lower liner. No attempt has been made to separate the Upper and Lower Terminal Zones. The two Terminal Zones are flowed through the tubing and the Ranger Zone is flowed between the tubing and water string. The Ranger Zone can be circulated in before setting the packer.

Diagram 2, has cemented off the Ranger Zone but has separated the two parts of the Terminal Zone. This requires a double cement job on one string of casing. At the present time, cement baskets are used on each job. Before running the casing, a drillable back pressure valve with tubing seat at top is placed immediately above the cementing holes and a baffle plate immediately below the cementing holes for the lower job. For the upper job a drillable ring large enough to pass the tubing and with a seat on top is placed below the upper cementing holes. After the liner is landed the tubing is landed on the seat provided above the lower cementing holes and that portion of the liner is cemented, measuring in the fluid to displace the cement. The tubing is then pulled and a ball is dropped to fit the seat below the upper cementing holes thus stopping circulation or pressure on the formation below. If a full string is used the usual cementing methods are followed. If a liner is used, the tubing is again run with a drillable cement retainer on bottom which is set in the blank pipe above the upper cementing holes. The cement is then pumped into place by measuring the displacement of fluid. The tubing is then backed off the retainer and pulled. After allowing time for the cement to set, the plugs and retainer are drilled out and the well completed as sketched. The Upper Terminal can be circulated in and will flow between the tubing and casing. The Lower Terminal has to be swabbed in and flows through the tubing.

Diagram 3, is a combination of 1 and 2 but a full string of casing is landed on a packer in the blank pipe at the bottom of the upper liner. This provides an outlet for the oil from the Ranger Zone between the flow string on a packer and the water string. The Terminal Zones are flowed as in Diagram 2.

Diagram 4, is another method of effecting the same combination as 3 but runs all of the liner at one time.

Diagram 5, uses the same combination as 2 but allows the use of a flow string set on a packer between the Upper and Lower Terminal Zones. A restriction on the inside of the packer forms a seat for packing off the tubing. The tubing has a tail piece below the packer to allow bottom hole tubing to the Lower Terminal Zone. Holes immediately above and a part of the packer assembly of the flow string allow the oil from the Upper Terminal to flow between the tubing and the flow string, thus giving an equivalent of bottom hole tubing to the Upper Terminal Zone. By the use of this combination, engineers believe that no casing or tubing will be sanded in the well. The use of flush joint tubing has improved the efficiency of the flow between the tubing and flow string.

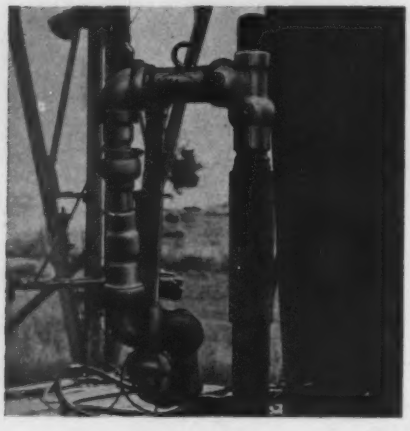
Diagram 6, illustrates another method of effecting the same combination as 2. This method uses short lengths of liners with the top of the blank pipe of a larger size. After cementing the lower length of lines, the hole is washed clean of excess cement and a second length is run with a marble guide on bottom. The marble guide goes into the top of the first section and is held in position by grips or dies in the enlarged portion at the top of the former liner. As many cement jobs as desired are completed in this manner. Then all are allowed to set and the cement is drilled out at one time. This method had the advantage of keeping cement out of the perforations above the blank pipe and yet allows the use of excess cement. How-

ever, there is the hazard that the operator might not be able to place an upper section in position which would nullify the entire combination.

Because of the probability of sticking tubing and packers in the well, a new type packer has been devised to reduce the future troubles. This new type packer provides for a special collar with a long recess to be placed in the casing at the depth at which the packer will be set. A drillable lead seal packer is then used which has short spring steel prongs which will expand to engage the special collor but are too long to engage a regular collar. They are made of such shape and strength that sufficient weight can be used to expand the lead seal. A left hand thread is provided at the top of the packer in order that the tubing or flow string may be backed off leaving a packer which can easily be drilled up if it cannot be pulled.

By the use of the various described casing and tubing combinations, an equivalent of two or three oil wells is created instead of one. When tubing capacities at moderate pressures are considered, it is obvious that more oil can be produced in this manner than by former methods. Also there are flow beans for each zone, causing each zone to have a different back pressure. Thus the maximum safe production can be obtained from each zone or one one can be produced with another closed in. This is desirable because each zone has a different rock pressure and gravity of the oil differs.

A discussion of this kind would not be complete without making a few predictions. I would expect the Ford Zone to be productive on the higher portion of the fault block west of the fault through the Long Beach Harbor area. I would also expect at some future time to see the primary water strings perforated to obtain heavy oil from above the top of the Ranger Zone. Newer and better combinations for flowing more than one zone will be developed in this area for future use in other oil fields.



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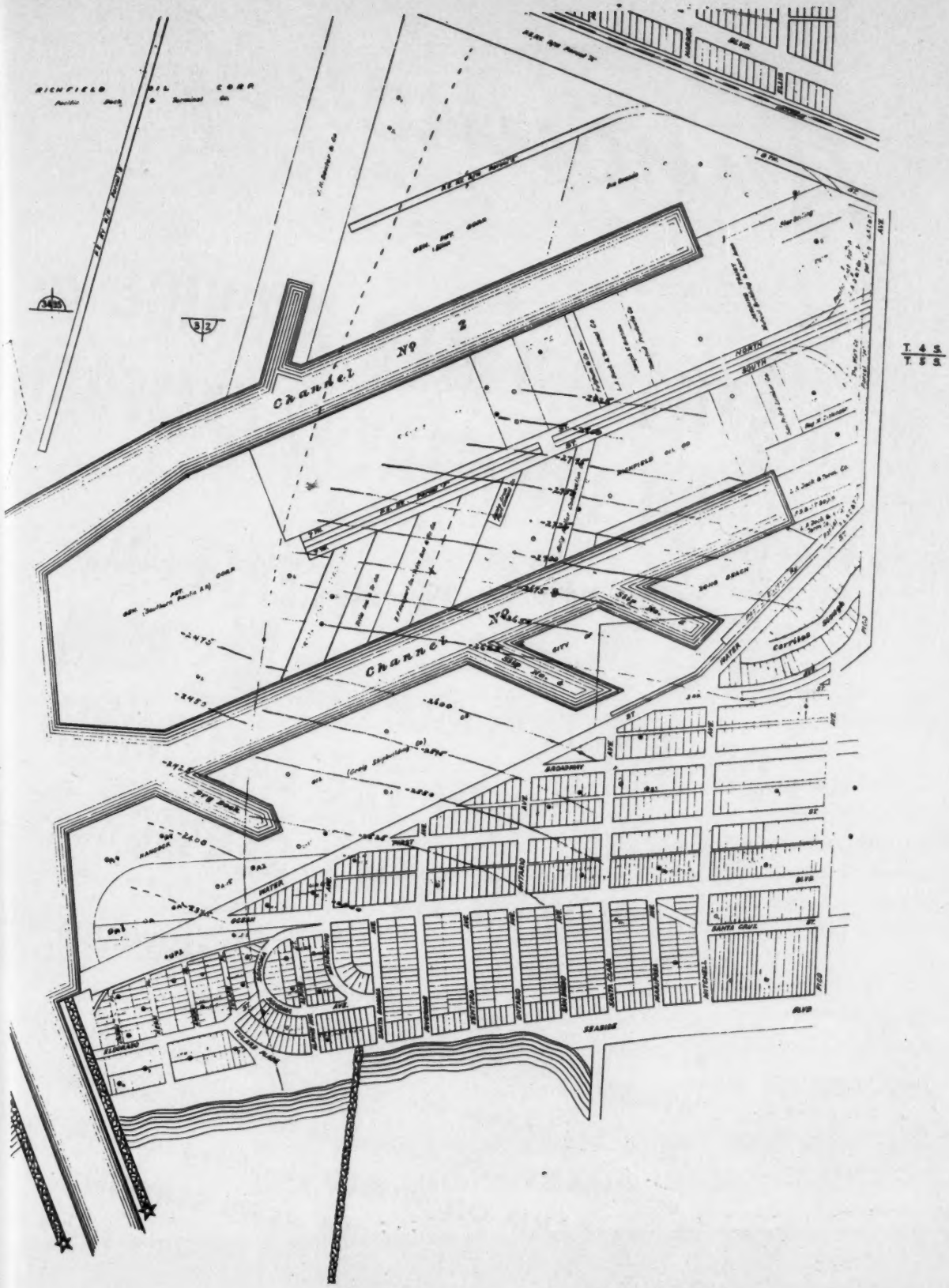
Dr. F. S. Hudson

Appointment of Dr. Frank S. Hudson as chief geologist of Shell Oil Co., has been announced. Dr. Hudson has been with Shell since 1926, serving as geologist and engineer. In 1914-1916 he was with Standard Oil Co. of New York in China, and in 1920 he was geologist, and later, field manager, for Ventura Consolidated Oil Fields.

Dr. Hudson received his bachelor's degree in mining engineering in 1912, and his Ph.D. in geology in 1920, at the University of California. He is a Sigma Xi, and a teaching fellow in geology at the University of California.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Hamildon Oil Co. Well (El 82) 1 15 3/8-697 4650 Sand and shale.

Oceanic Oil Co. Well 6 6 5/8-3920 4438

Richfield Oil Corp. Bixby (El 88) 4 8 5/8-1120 4120

Shell Oil Co. Alamitos 44 621 Sandy shale - spud 3/2/38.

Signal Oil & Gas Co. P. E. (El 85) 1

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H. E. Moulton

H. E. Moulton, chairman of the finance and budget committee of the California Natural Gasoline Assn., went into the laboratories of Pacific Gasoline Co., after his graduation from the University of Southern California with a degree in chemical engineering in 1919. Five years later he joined the staff of the Chanslor-Canfield Midway Oil Co., as gas engineer. For the past eight years he has been superintendent of the gas division for C.C.M.O. Mr. Moulton is also a member of the C.N.G.A. executive committee. The committee of which he is chairman sees to the provision and distribution of the wherewithal for all other association activities.

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March, 1938

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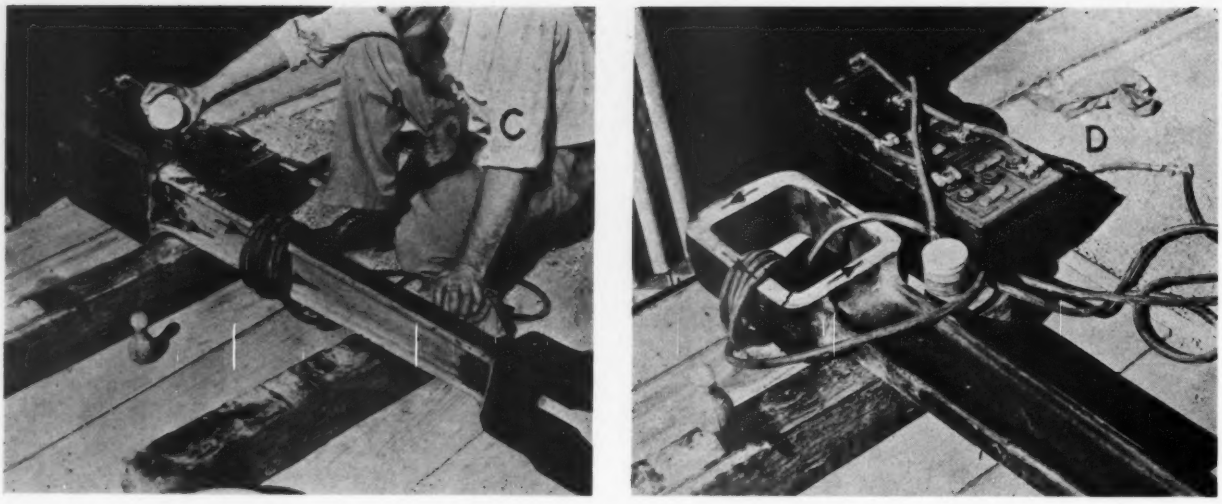


Left, cable method of magnetizing connecting rod to locate traverse cracks; right, circular method of magnetising the end of a rod.

Detection Of Fatigue Cracks

By Taber de Forest,
Magnaflux Corp.

Almost all parts which are subject to dynamic stress are also subject to fatigue. Whether they are as large as the tail shafts of ships or as small as airplane engine valve springs, the principle involved is the same. No one has ever witnessed the actual birth of a fatigue crack, for it was not there yesterday and it is here today, but we do have a fair idea of its history as it progresses, growing larger and larger until failure occurs.

There are many factors which may cause the start of a fatigue crack. Almost all of them may be attributed in one way or another to a notch effect or stress concentration. To illustrate the notch effect we may try tearing a piece of cellophane. When the stress in the cellophane is well distributed, as is the case when no minute tear exists, great force is required to pull it apart. However, once a tear is started, extreme small force is required to keep it progressing, and its direction may be changed by changing the angle of stress. In actual practice there are a number of notch effects which are likely to occur in machinery parts. The fundamental design of the machine is often responsible for many of the notches encountered. Cracks have often been found which start at key ways or around oil holes placed in a stressed portion of the specimen. Sharp corners are perhaps the greatest offenders. It is only fair to the engineers responsible for the design of machinery to say that many of these causes are being eliminated. Another source of notch effects is actual irregularities in the surface of the metal or, in some cases, in its interior. There may be flaws in the original ingot which, having escaped detection, may exist in the finished product. Sometimes there are flaws which have been introduced during the process of manufacture, such as cracks caused by improper heat treating or grinding. Another source of fatigue cracks may be attributed to carelessness on the part of the operator. Occasionally extremely long wrenches are used to tighten nuts. This treatment often causes cracks between threads and later, failure. In crank shafts misalignment of bearings or distorted shafts will throw additional stress in areas between bearing surfaces and webs. The repeated stress concentrations will cause cracks and finally failure unless detected.

Once a fatigue crack has started it becomes the sharpest kind of a notch. It is the sharpness of this notch and not the reduction in area which causes progressive failure. When a fatigue crack is started in the presence of corrosion, the corrosion will attack the bottom of the crack, like decay in a tooth, eating away the grain cement. Caustic embrittlement is an example of this type of crack.

To discover the nature of fatigue we may examine the section of a part which has failed. Lines forming arcs will extend from the source of the cracks. There are some cases where the source seems to extend all the way around the part. An example of this is a railroad axle where stresses between axle and journal may cause many very small sources that run together as they grow. In this case a typical progression of the fatigue crack will form concentric circles working in toward the center. The actual area of the final break may be less than one-fourth the cross section of the axle. The appearance of the final fracture is coarse and crystalline, while the appearance of the area which progressively failed in fatigue is smooth. A small amount of cold work takes place during the progress of a fatigue crack. This hardens and strengthens the metal at the bottom of the crack, which in turn is cracked by more deformation. Probably the local ductility at this point is spent. The length of time it takes for a crack to propagate from its source to failure is relatively long. Most of the data which we have in this respect is obtained from laboratory experiments on fatigue testing machines and corroborates what little knowledge we have gained from the actual field. Hence, given a means of locating a crack, we have a relatively long time in which to apply it. It is not a matter of just happening to find the crack before the part breaks, but the crack has been there and will be there. It is true that eventually the part will fail, but with sufficiently frequent periodic overhauls it is possible to locate the crack before failure occurs. For heavy horizontal compressors, an annual inspection is probably more than adequate. In railroad shops, such parts as axles, side rods and valve motion parts are examined for cracks during overhaul.

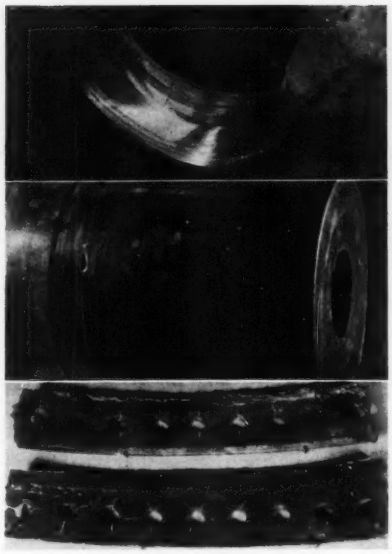
Many methods have been used for locating cracks, most notably the kerosene and white wash method and etching. The kerosene and white wash method has served this purpose fairly well. However, it has the disadvantage that

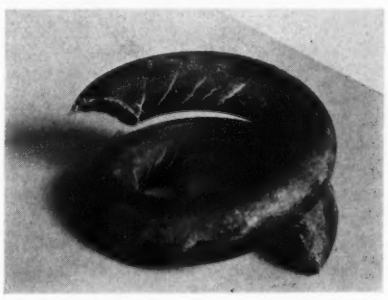
it will not locate cracks too small for the kerosene to penetrate. It is also rather slow and difficult to apply. Etching is essentially destructive to the surface, which should later be restored by polishing. About eight years ago a magnetic process was introduced to detect fatigue cracks. It is commercially known as the Magnaflux method. It was first used by manufacturers and operators of aircraft to locate flaws in engine parts, where failure is a matter of life and death. Since that time it has spread to the heavy industries, such as railroad shops and oil tool manufacturing companies, who are now successfully applying this process.

The Magnaflux method of inspection consists first in magnetizing the specimen in such a way that the lines of force, or magnetic flux, are in a direction which is approximately at right angle to a probable crack. This causes a high magnetic leakage field to occur at the extreme edges of the crack. A special preparation of finely divided iron is then applied to the specimen, and a portion of it will tenaciously adhere in the leakage field caused by the crack, giving an unmistakable indication.

To get a better picture of what goes on, let us imagine a bar of steel which we bend in a circle, placing its ends very close together. Then we magnetize the bar and the result is a horse shoe magnet with poles nearly touching. Now let us consider the space between the poles to be a crack. We all know that this crack will attract iron filings. You will note that the magnetic field is crossing the crack at right angles in this case and the presence of the crack disturbs it considerably.

There are a number of methods which may be used to magnetize machine parts in the field, and I will touch briefly on a few of them. The most effective is to pass a high amperage, low voltage current through the part itself. A conductor, and in this case the part, will be surrounded by a circular magnetic field. Since the part is steel it will be magnetized by the current in a circular direction and this magnetic flux will locate any crack lying at right angles to it. The advantage of this type of magnetism is that there are no magnetic poles associated with it except where it may cross a crack, the magnetic lines merely going around in a circle. When a steel part has a hole in it, such as the end of a connecting rod, a copper conductor may be led through this hole and the magnetic field which surrounds the conductor will magnetize the end of the





Top, crack in an oil well hook; upper center, typical fatigue crack in a railroad axle; lower center, caustic embrittlement cracks; bottom, fatigue cracks in a heavy spiral spring.

connecting rod in a circular form, as mentioned above. At times it is more advisable, and even necessary, to magnetize the specimen by taking a heavy cable carrying a high amperage current and wrapping this about the specimen. The current then flowing through the coil so made will magnetize the specimen, causing a south pole to appear at one end of it and a north pole at the other. This method will locate cracks which may appear at right angle to the major axis of the specimen. It is used advantageously on parts such as crank shafts and axles.

The amount of current used depends to some extent on the size of the specimen to be tested and the material out of which it is made. Usually more than 1000 amperes are needed, while the voltage may be extremely low. Standard magnetizing units are available which make use of either alternating or direct current. In testing high carbon steels it is only necessary to apply a single shot of current taking less than a second, and the residual magnetism is sufficent to indicate any crack. In dealing with low carbon steels which do not retain magnetism it is necessary to maintain the magnetizing force while the power is being applied.

In testing large parts, particularly when they are dark in color, a light colored powder may be used, which is applied with a shaker, like salt. For testing brightly finished parts, particularly ones which are small, a black powder may be obtained which is used in a mixture with a light oil. Parts may be submerged in this mixture, or the fluid may be applied to the part with a paint brush or oil can.

Sometimes it is advisable after testing parts to demagnetize them, particularly if there is a possibility that they may attract iron particles from the lubricant. This is accomplished by passing the part through an alternating current field which repeatedly magnetizes it, first in one direction and then the other. As the part is slowly withdrawn, the effect becomes weaker leaving the part demagnetized.

The Magnaflux method has the advantage of being a non-destructive test. The indications may be interpreted by anyone, and require no specialized knowledge. It is interesting to note that when a crack is deep more powder will adhere to it, while when the crack is shallow the indications will be slight. Defects slightly under the surface will produce fuzzy indications and not as well defined ones as those at the surface. Fortunately fatigue cracks almost invariably start at the surface, which makes the method ideal for locating this type of defect, even though many of them are so small that they cannot be seen with a microscope. Scale will not interefere with the indications providing it is not thick, and neither does paint nor plating disturb the indication. Magnaflux is excellent for distinguishing the difference between scratches, which sometimes look very much like cracks, and actual cracks. However, care may be taken not to have the part too highly magnetized when doing this type of work. The same caution should be observed when searching for cracks between threads.

As yet we know of no better way to eliminate failure by fatigue than to overhaul and inspect carefully mechanical parts which are subject to repeated stress. In spite of the fact that great advances have been made in studying fatigue from all angles and that machinery is better designed, better engineered and better handled, fatigue is a problem which is ever with us.

Compressor Lubrication

J. G. McLeod, Manager,
Industrial Lubrication Oil Sales,
The Texas Co.

The efficient lubrication of any piece of machinery requires a fundamental knowledge of the general laws of mechanics and thermodynamics coupled with a thorough understanding of the chemical principles involved. This constitutes a broad, comprehensive study of a field of engineering which deals specifically with the science of lubrication.

The basic theory governing all lubrication is that of the converging film, which also introduces the characteristic commonly known as viscosity. Naturally, there are many other factors that materially affect the proper lubrication of equipment, but a detailed elaboration of these is not the function of this paper, and, therefore, only those which influence the correct lubrication of machinery in natural gasoline plants will be considered. No attempt will be made to present mechanical details except where they are particularly pertinent to the subject of lubrication.

As a matter of sequence, the lubrication of the gas engine will be considered first, and then those phases peculiar to the lubrication of the compressors will be presented.

The Gas Engine

This engine, as the prime mover and the key to the smooth operation of the plant, must be carefully and properly lubricated to attain the maximum efficiency. The most successful system of lubrication employed is that of mechanical force feed for the cylinders by means of a positive mechanical lubricator along with a positive circulatory system for bearing lubrication. While splash systems are widely used for bearing lubrication, they are not preferable. Insurance against defective lubrication and resultant high maintenance and operating costs necessitates positive action at all times.

The selection of the best lubricants suited to the particular operating conditions will also determine the number required. Frequently, where load conditions are not severe, one oil will accomplish the objective economically and efficiently, but in many cases two oils are desirable for maximum results.
Oils used for circulatory systems involving bearing lubrication should possess certain very specific properties that are prerequisites for true economy. First, the oil must be of the proper viscosity to prevent metal to metal contact under operating temperatures and conditions but not too high to increase, needlessly, the coefficient of friction, thus upsetting the balance of heat transfer and throwing an unnecessary load on the circulatory pump. Second, it must possess and retain a tough film, be highly resistant to oxidation, and drop extraneous material readily, as well as filter readily, with a good recovery. These qualities assure good lubrication provided the bearings are not subject to mechanical defects.

Cylinder lubrication makes much more severe demands on the oil chosen. Its characteristics must be such that it achieves an unusual chemical and physical balance. It must be highly resistant to oxidation factors, since an oil which oxidizes readily means stuck rings with the possibility of frozen pistons. It must deposit a minimum amount of carbon, and that which is formed should be practically non-abrasive to minimize cylinder wear. It must also be of the proper viscosity to protect, adequately, the moving surfaces at all times, but not too high so that the internal friction of the oil itself induces excessive heat even though a good film is secured temporarily.

There are certain pertinent operating factors that exert a direct influence on the ultimate results in cylinder lubrication. They are air leakage, improper cooling, and improper cleaning of the air used for combustion.

Frequently air is entrained in the gas used for fuel, which if the quantity is sufficient, may cause pre-ignition with subsequent temperatures which impose severe demands on the oil. This causes breakdown of the oil regardless of the degree of refinement. Thus, excessive carbon is formed which may cause serious damage and subsequent operating delays.

Very few of the plants are equipped with facilities for treating the cooling water. Often the deposition of scale interferes seriously with effective cooling which will definitely induce higher cylinder temperatures with subsequent destruction of the oil film, which again means excessive carbon deposits.

While most plants scrutinize carefully the air intake conditions, in many instances the capacity of the air cleaners is insufficient, which will cause breakdown of the oil, resulting in excessive cylinder and ring wear. When the analyses of used oils show a high ash content, poor air cleaning is clearly indicated.

The amount of oil to be fed to the cylinders has long been a subject for discussion but all engineers concur in the opinion that excessive quantities of oil fed to the cylinders may readily be the source of inefficient operation regardless of the quality of the oil. It is imperative that sufficient oil be fed to assure lubrication at the top of the cylinder, but careful observation of the exhaust will readily indicate excessive feeding. Naturally, if there is excessive feeding of the lubricant over a prolonged period of time and material quantities of dust are also present, the operation of the engine is seriously impaired.

Compressors

The nature of the product subjected to compression is such that it presents specific problems that may readily render satisfactory lubrication very difficult. When the gas being compressed is rich in gasoline vapors, the latter acts as a cutting agent or diluent, especially in connection with straight mineral oils. Again, gas which is corrosive in its action, due primarily to sulphur being present in a corrosive state, will attack a straight mineral oil more readily than a compounded oil. However, dry gas operates best on a straight mineral oil.

Where wet gas containing an unusual quantity of gasoline vapors is encountered, a compounded oil containing from three to four percent of prime lard oil is best adapted for the proper lubrication of the compressor as it resists the washing action to a far greater extent than the straight mineral oil. Although a heavier viscosity oil is desirable, the use of oils of more than 750 seconds at 100° F., Saybolt Universal, should be considered only after investigation has revealed that abnormal conditions exist. The deleterious effects of carbon deposits on the cylinder walls and valves are too serious to ignore when too heavy bodied oils are used. The use of an oil compounded with lard oil is also advantageous when corrosive sulphur is affecting the economical maintenance of the plant.

Dry gases when compressed do not have any cutting action on the oil and, therefore, a highly refined straight min-

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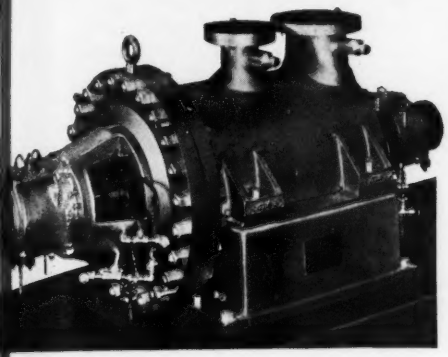
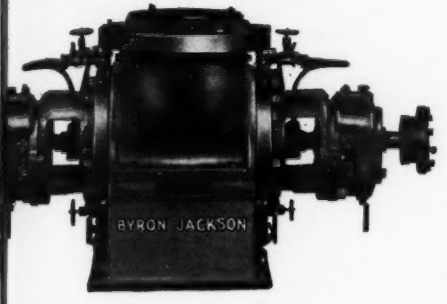
N REFINERY OPERATION

OT OIL CHARGING PUMP for hot oil and other liquids



This Byron Jackson pump is of double-case construction and may be direct-connected to the motor for constant speed, or steam turbine or dual drive for variable speed. The horizontally-split inner case permits assembly of complete rotating element IN THE SHOP, as a separate unit. Other features include: Both stuffing boxes under low pressure; Minimum number of parts; Chrome-alloy steels which provide resistance to coking, corrosion and erosion; No diffusion vanes. Capacities range from 2,500 to 40,000 barrels daily at pressures up to 2100 pounds per square inch.

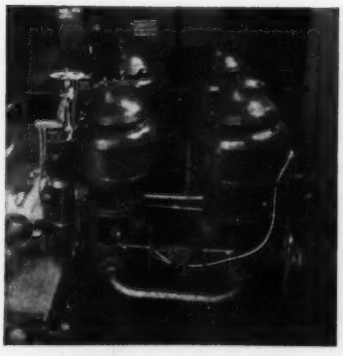
NGLE STAGE DOUBLE SUCTION PUMP for high capacity; low and medium heads



Features include: Center support under nozzles eliminates misalignment due to pipe strains at high pressure; Case and cover sealed by two circular gaskets, only one of which is broken to dismantle pump; Simplified piping; Both stuffing boxes at suction pressure; Negligible bearing loads. Field of application: from 800 to 3000 GPM at temperatures to 800 degrees F., against 250 to 800 foot heads.

HYDROPRESS for low capacity; pressures to 2,500 pounds

ere is the pump that meets successfully the demand for modern unit to handle small capacities at high pres-res. Capacities range from 10 to 250 GPM against ads ranging to 2,500 pounds per square inch. Available th totally enclosed, explosion-proof motor. Single stuff-g box, under suction pressure only, makes the Hydro-ess especially suited for handling wild oils, and hot or ld oil at high pressure. This unit is particularly desir-le as a Seal Oil Pump. Controls can be manual or tomatic, local or remote. Minimum floor space re-ired, as shown by cut of installation of four Hydro-ess pumps (right).



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The electric motor of the SUBMERSIBLE Turbine Pump is direct-connected below the pump and the entire unit is suspended by the discharge pipe to operate submerged in the well water. Safety is thus insured. The liquid being pumped cannot come into contact with any of the electrical parts or motor bearings as these are enclosed in a case filled with high dielectric oil, with a mercury seal where the shaft passes through at top.

SUBMERSIBLES provide a constant supply of water—with low operation and maintenance cost. Oil can be added to the motor from the surface, yet many SUBMERSIBLES now in service have operated for more than five years without addition or change of oil.

No pump house is required. There is no long shaft to waste power through friction losses or to cause trouble. A weather-proof, tamper-proof switch-box is the only surface equipment required. Control is manual or automatic. The SUBMERSIBLE requires no priming—hence, is ideal for remote control service.

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eral oil is employed to best advantage. A straight mineral oil which has been properly refined will not deposit as much carbon or gum and thus is better suited to the efficient lubrication of the compressor. The viscosity of the oil varies considerably but, ordinarily, the range is from 300 to 750 seconds, Saybolt Universal, at 100° F., although the justifiable use of an oil in excess of 500 seconds is rare.

The underlying cause of improper lubrication, where carefully refined oils of the proper viscosity have been used, is excessive oil feed. Unfortunately, it is not possible to state specifically exact quantity ratios since the operating conditions vary so widely but careful observation by the operator with the assistance of a competent lubrication engineer will readily determine the setting of the force feed lubricator.

While I have dealt in general with the qualtities of the oils involved, I have not emphasized some of the properties that should be inherent in the oils used and the relative values of these properties.

Generally, the flash point of the oil is not a factor and should be considered only when compressor temperatures encountered are such that partial distillation could take place . This condition of course, should be eliminated as soon as it is practical to do so as the source is generally bad overloading or improper cooling.

A completely distilled oil is preferable at all times regardless of the crude base. Oils of this type deposit a minimum amount of carbon when properly refined.

The term "carbon residue" is used rather loosely at times and, being an empirical test, deserves clearer definition. While two oils may show the same percent of carbon before use, the tendency of these oils to breakdown and form carbon or gummy deposits is not apparent from this particular test and, therefore, undue stress is sometimes placed on this characteristic without giving ample consideration to the degree of refinement which the oil has undergone, the latter being the major consideration.

The deleterious effect of the use of too high viscosity oils to compensate for mechanical defects or inequalities cannot be under-estimated when compared with increased maintenance costs.

Only the more salient points that deal with the lubrication of gas engines and gas compressors have been presented since the field is broad and the problems encountered vary widely; consequently, there are many phases which have not been covered in detail. It will be a pleasure to answer any questions if I have the information desired.

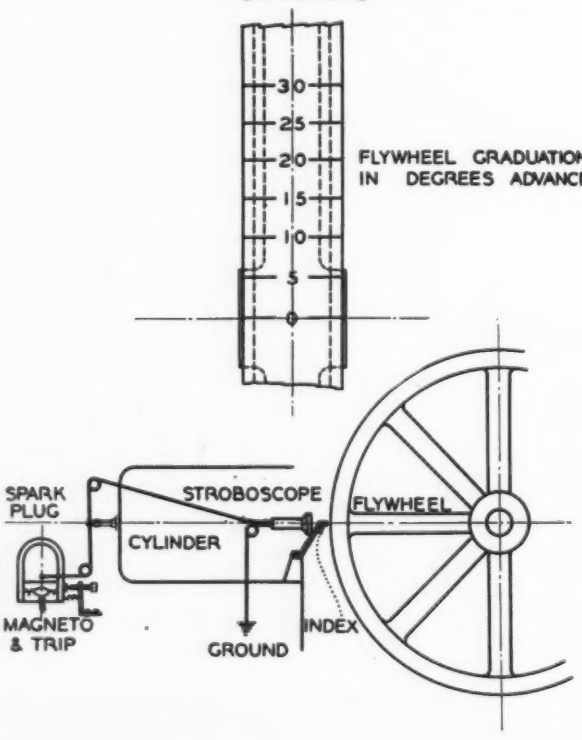
Use Of The Neon Tube In Ignition Timing

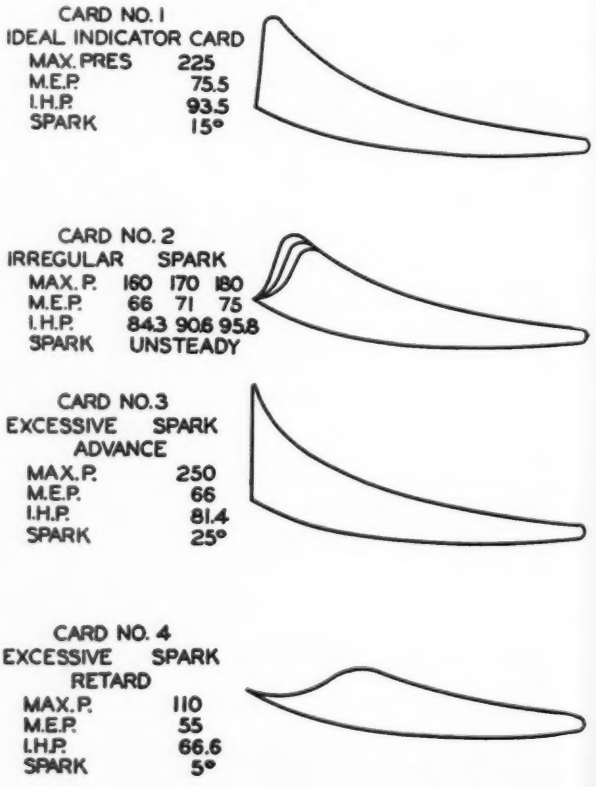
By Grove Lawrence
Southern California Gas Company

The importance of accurate ignition timing in the operation of internal combustion engines is generally well recognized. Its effect upon the types of large, slow-speed units in gas compression service was covered in a paper which was presented before this Association several years ago.†

By way of brief review, a set of power cylinder indicator cards from a 160 h.p. 18x20-in. gas engine are shown here. Card No. 1 was taken with all the adjustments, such as valve and ignition

Left, arrangement for using neon stroboscope for checking ignition timing; right, indicator cards showing effect of ignition timing.





timing, air-fuel ratio, etc., at the best possible setting. Card No. 3 was taken after the ignition had been advanced 10° ahead of the best position, with all other adjustments remaining undisturbed. The result was a loss of power with an increase in peak pressure. Card No. 4, taken with the ignition timing set 10° later than the best position, also showed a loss of power. The condition shown by Card No. 2 will be discussed later.

In casting about for a practical means of checking ignition timing under operating conditions, it was found that a form of stroboscope had been developed for use in automotive work. This instrument is available commercially at a cost of about $5.00. It uses a small neon tube as a source of illumination, and can readily be adapted for use in checking stationary gas engines.

The term "stroboscope," as used herein, is intended to mean an instrument which gives the visual effect of stopping or retarding motion, by supplying a source of illumination which is interrupted in synchronism with the normal motion of the parts to be examined.

The Principle Illustrated

The diagram shown is intended to illustrate the principle of the device, and its application to the problem at hand. It consists of a small neon tube mounted between a reflector and a lens, and the whole arrangement resembles an ordinary pocket flashlight. A pair of rubber-insulated leads are provided, to connect the neon tube to the spark plug, and to ground.

It is characteristic of the neon tube that a small, hi-voltage current will cause the tube to emit an appreciable amount of light, and that the duration of the after-glow is very brief when the current is shut off. In our application, with the high tension wire from the spark plug as the only source of current, it is obvious that light will be emitted only at the instant that the spark occurs at the plug terminals.

Most engines are provided with a fixed pointer or reference mark near the face of the flywheel. To use the stroboscope, it is only necessary to paint a narrow stripe across the fly-wheel face in such a location that it will be opposite the reference pointer when the flywheel is in the position at which the spark is required to occur. Having the mark in the proper position, one lead from the stroboscope is clipped on a spark plug terminal, and the beam from the neon tube is directed to the face of the flywheel at a point opposite the reference point, or index. With the engine operating at full speed, if the magneto timing is correct, the flywheel stripe will appear in the field of illumination, directly opposite the reference point. It was found unnecessary to ground the second lead from the neon tube.

Useful with Units Having Oscillating Magnetos

This device is most useful in the case of units having oscillating magnetos, which are likely to have an appreciable time lag between the instant the armature is tripped, and the instant the spark occurs at the plug points. This time lag varies for each magneto and tends to increase as the magneto trip springs become fatigued. With a practical means of checking timing with the engine running, it becomes desirable to provide a screw adjustment on the magneto brackets so that the "lead" can be changed from time to time to compensate for increasing lag.

An interesting sidelight on the use of this device appeared during some of our tests, and is illustrated by Card No. 2.

The condition shown was caused by a badly worn magneto. While the defect can be detected readily by use of the indicator, it would not be caught by ordinary operating methods, such as try-cock tests. The application of the stroboscope immediately revealed that the magneto was so badly worn that the spark advance varied 5° from one revolution to the next. Replacement of the defective magneto produced the card shown as No. 1.

For experimental purposes, it is suggested that a series of lines one of more degrees apart be painted on the flywheel face, and numbered to correspond with degrees of flywheel rotation. With this arrangement, and a suitable adjusting device on the magneto bracket, the spark advance can be changed at will, and maintained with a satisfactory degree of accuracy.

The author gratefully acknowledges the assistance rendered by M. J. Binckley of the Southern California Gas Co., and members of his staff, in the development of this procedure.

† Proceedings of the Pacific Coast Gas Association, Vol. 23 (1932), p. 301.

Refinery Executive Joins Dubbs Staff

Ray G. Cocanower, well known in the refining industry of the southwest, has just joined the staff of Universal Oil Products Co., Chicago, as a sales engineer. It is understood that his work will be mostly in the Mid-Continent field where he has had long experience as an executive both in the sales and operating departments of refineries.

Mr. Cocanower was manager of the Olney Oil & Refining Co., Olney, Texas, from 1929 to 1935. He left that position to become manager of the Waggoner Refining Co. at Vernon, Texas. He recently left the Waggoner company to join Universal.

Tretolite Wins In Patent Case

In an opinion handed down in Los Angeles, Federal District Judge Harry A Hollzer found U. S. patent No. 1,467,831, relating to a process for removing water and emulsion from crude petroleum oil by means of chemicals, to be valid and infringed. The opinion was delivered in the case of The Tretolite Co., et al., Plaintiffs, vs. Research Products Co., Ltd., et al., Defendants. This suit was filed in November, 1933; and was tried before U. S. Commissioner David B. Head, sitting as Special Master, in 1935. The particular reagents used by the defendants is known as "Hydrate 488."

The opinion confirms the findings and conclusions contained in the Master's Report, which was filed in 1936. Judge Hollzer's opinion states:

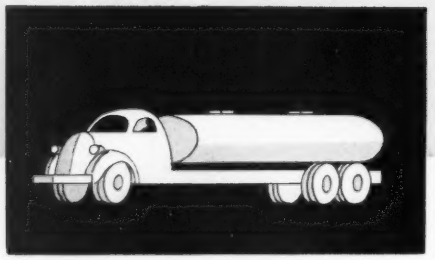
> "The Court concludes for the reasons herein set forth, as well as upon the grounds stated in the Master's Report, that the exceptions taken by the defendants to the Master's Findings and Report should be overruled and that a decree should be awarded to Plaintiffs as recommended by the Master."

The Master's Report recommended that "a decree be entered in accordance with the foregoing conclusions, that an injunction issue restraining the defendants from the acts found to infringe Letters Patent No. 1,467,831 and that an accounting of profits and damages be had."

The chemicals involved in this decision are in wide use in the oil fields of the world for breaking crude oil emulsions.

Efforts of a group of independent California oil producers to obtain widespread sponsorship of a proposed oil control measure were unsuccessful when about 300 producers, meeting at the Biltmore Hotel, Los Angeles, on March 4, failed to recommend that the bill be placed on the call list by the Govevrnor.

LOW-COST TRANSFER



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Utility, speed and economy are vital elements when you're trucking crude. The electric transfer pump gives you both. A simple, compact 7½ h. p. outfit will load a 100 bbl. truck in 12 minutes at a cost of one-fourth of a cent for electricity. In addition, a push button control can be conveniently located at the driver's hand, thus saving the cost of a man on the ground.

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SOUTHERN CALIFORNIA EDISON COMPANY LTD.

Field Development

Los Angeles Basin

Two Good Producers In Northwest L.B. Area

Long Beach northwest extension was the scene of excellent completions recently by Hilldon Oil Co. and Richfield Oil Co., each adding a better than average producer. On the Bixby Lease where no work has been done since the completion of No. 3 by United Oil Co. previous to its absorption by Richfield, well No. 4, was drilled to 4225 ft. and brought in pumping 575 bbls. of 23 gravity clean oil from 105 ft. of Alamitos oil sand. With the pump shut down, the well flows 495 bbls. and 350,000 cu. ft. of gas through ½-in. bean. Hilldon Oil Co., not to be outdone in its own discovery area, completed well No. 2 on the county flood control property with initial production of 550 bbls. This well is producing a 95 ft. interval below the shoe of the 9-in. casing cemented at 4085 ft. In an attempt to exclude persistent water, John Abrams & Associates deepened Willis No. 1 to 4642 ft. and cemented a 4¾-in. blank liner on bottom which was later gun perforated opposite oil sands. Tests to date have been inconclusive. Near Hilldon's Flood Control No. 2, Union Oil Co. has failed to develop satisfactory production from Oil Operators No. 4 which was carried deeper than neighboring wells to test possibilities below the top of the Alamitos zone where all production has so far been obtained. The interval now being tested, 4343 ft. to bottom at 4408 ft., yields only 15 bbls. a day cutting 27%. Believing that the productive area may be extended to the northwest, Caminol Co. Ltd. is rigging up to drill a portion of the Dominguez Estate on a sub-lease from the Hilldon interests. The well, known as Dominguez No. 1-8, is located approximately 400 ft. westerly from Flood Control No. 1, which, because of poor mechanical condition, has been abandoned after a nominal amount of wet oil. The two southerly outposts of Marvell Oil Co. and Kramildon Oil Co. have reached depths of 2150 ft. and 5210 ft. respectively, neither well having yet encountered anything.

In the original Signal Hill Discovery area, Oceanic Oil Co. has deepened well No. 5 to 4438 ft. where the well will be recompleted.

Union Bell 100 Tests Proving Disappointing

Union Oil Co.'s deep Santa Fe Springs well, Bell No. 100, apparently is not destined to contribute to the general threat of over-production. The 11,314 ft. hole was thoroughly tested below the liner shoe at 11,215 ft. with the net recovery of only a few bbls. of light oil. At present the well is being plugged and tested by stages, the last in a 90-ft. interval above 9945 ft. flowing 215 bbls. of salt water a day. Sands cored just above the final depth gave good cuts, had strong odors and showed high gas pressure when removed from the core barrell, but were of too low porosity to permit of adequate saturation. This well ends Union's program of deep exploration in Basin fields which resulted in the discovery of only one new horizon—the Eighth Callender zone at Dominguez.

Texaco Proposes Venice Drilling Plan

Application of the Texas Co. to drill a prospect well in the Venice area of the city of Los Angeles has created a tempest exceeding the teapot variety. Residents of the district in question are unable to agree as to the desirability of oil exploration in the vicinity of their homes; the question has stirred up two opposed factions. Zoning application is scheduled to be again considered by Los Angeles city officials after a second two weeks postponement for further study.

The Texas Company's plat consists of a block of 450 acres approximately two miles north of the old Venice field and two miles back from the ocean. A tentative location for the test well has been made on a five-acre tract at the intersection of Morningside and Glyndon streets where results of a geophysical survey indicated a schist "high". Two possibilities for production are believed to exist in the area as in the Venice field, where an upper sand was productive from 3500 ft. and the weathered schist at the Miocene-Basement contact provided a preview of conditions later to be found at Del Rey and El Segundo.

Four Strings Active In Dominguez Field

Four strings of tools are now working in the Dominguez field, three on the Union Oil Co.'s Callender lease and one on the joint Shell and Union Reyes property. Callender Nos. 58, 59 and 60 are drilling at depths varying from 5950 ft. to 6723 ft. while the Shell project, Reyes No. 94 has just passed 3000 ft.

Selbar Oil Co., which recently completed a small but clean edge well on the old United lease is said to be planning to drill another.

Abandon Deep Play in Richfield Gurnsey 1

Discouraged after finding the Terminal and Ford zones unproductive, Richfield Oil Co. has given up hope of developing deep production in Gurnsey No. 1 at Broadway and Mitchell Sts. From its total depth of 6078 ft., the hole was plugged above 3000 ft. where the well will be completed in the Ranger sand with an expectancy of 300 to 400 bbls.

L. B. Harbor Area Nearing New Highs

With the inauguration of voluntary curtailment March first, the threat of overproduction from the prolific Terminal zones in the Long Beach harbor area has at least temporarily diminished. Late in February field production, with Terminal wells practically wide open, reached an all time peak of 123,000 bbls. a day, a figure which dropped 25% under the 2000 bbl. per well allotment.

The low point under curtailment was struck March 3 at 91,050 bbls. but a new flood of completions boosted the total to 127,079 bbls. on March 15 and it became obvious that more drastic measures must be adopted. Accordingly, operators in the "hot spot" again saw the handwriting on the wall and instituted a new policy under which wells when first completed will be allowed to produce no more than 2000 bbls. a day and after a short time at that rate must be cut back to not over 1000 bbls. daily.

First production from Long Beach city owned land was obtained with the completion of four wells in quick succession by Westgate Greenland Oil Co. on the "A" lease near the entrance channel. These wells, all bottomed at approximately 3885 ft. and flowing only from the Terminal zones, are the highest structurally in the field and have a combined potential of over 25,000 bbls. a day. The city receives 50% royalty. Offsetting Westgate Greenland's No. 3, Hancock Oil Co. finished Harbor E-6 from 4023 ft. flowing initially 6690 bbls. Following Hancock's usual procedure, the 8⅝-in. oil string was perforated in the Ranger which is flowed around the tubing, and in both Terminal zones which are produced together through the tubing. A tubing packer is set in the blank section between horizons accomplishing the separations.

Long Beach Harbor Oil Co., Cedarholm No. 2, located at Tulare Place and Drawbridge Way, was finished at 3790 ft. with perforations in Ranger and both upper and lower Terminal zones. Although never wide open, production before beaning back passed the 5000-bbl. mark.

General Petroleum Corp. completed four wells recently, Harbor Comm. No. 5 being the only well thus far brought in from the Lower Terminal zone alone. Mechanical set up is similar to others in the area and the Upper Terminal can be circulated "in" whenever desired. Initial production from the lower sand was 2400 bbls. of 27.8 gravity. Other completions by General Pet. were Channel Comm. No. 5 which is being rigged to pump after flowing 150 bbls., Harbor Comm. No. 9 flowing 400 bbls. and Ford No. 36 which has been beaned back from 1000 to 410 bbls., all producing the Ranger zone.

Richfield Oil Corp. was the first in the Long Beach area to use gas lift. Richfield Terminal No. 2, a Ranger well, was completed in this manner flowing 220 bbls.

The operating combination of A. T. Jergins and Superior Oil Co. obtained approximately 400 bbls. each from Backbay Nos. 2 and 3, the latest to be completed in the top sand, while Allied Petroleum Corp. well No. 27 appeared to be in the same class. These wells are located in the ocean front area but are east of the fault cutting off lower production.

F. Kenneth Morrison

One of the recent visitors to California was F. Kenneth Morrison, vice president of the Mason-Neilan Regulator Co. of Boston, Mass.

Mr. Morrison spent considerable time in California with Mr. O. F. Mason, manager of the California office and was favorably impressed with the activity in California and the acceptance by this industry of his company's products.

Mr. Morrison says that the Mason-Neilan Regulator Co. is enjoying a fine business in the foreign fields and that the company recently opened a district office in Paris, France.

George L. Tyler

George L. Tyler, new C.N.G.A. secretary, entered the natural gasoline industry in 1921 as stenographer for Wallace & Brooks, Inc. (W. J. Wallace of Wallace Refineries, Los Angeles). Then to Los Angeles in 1922 for Wallace Refineries and Pacific Gasoline Co. as clerk, statistician and later in contract department. In 1926 Mr. Tyler joined Standard Gasoline Co. In 1929-30 he was in the land department of Shell Oil Co. He was federal receiver of Nelson Petroleum Co., Ltd., and Knickerbocker Oil Co. in 1931-32. In 1935 he became contract agent for Del Rey Oil & Gas Co.

To Drill Near Fault In Old Potrero Area

A new corporation has been formed by Cornelius G. Willis, president of the Hilldon Oil Co. The new organization, known as the Basin Oil Co., is preparing to drill on the much prospected Potrero Country Club golf course on a line between the old wells on the property and the former boom area north of Manchester and west of Prarie. Mr. Willis, who developed the new Long Beach extension, has given the Potrero area a very close study and is convinced that wells drilled close to the fault on the club property have an excellent chance of becoming commercial producers. All wells drilled in this vicinity have found small quantities of oil, generally of 40 gravity, but few have succeeded in eliminating water from the flow. Interpretations of the structure differ widely because of the extremely complex cross faulting at this point on the Inglewood fault.

Model 14-C Wire Line Head Jensen Pumping Unit in operation in the Wilmington Field. This Unit has a maximum capacity of 14,000 lb. peak load.

PAUL A. MEDEARIS

HARRY M. TAYLOR

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MEDEARIS OIL WELL SUPPLY COMPANY

as California Stocking Dealer for the Jensen Bros. Mfg. Co. Line of Pumping Units.

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are manufactured by one of the oldest exclusive manufacturers of Pumping Jacks in the business today and may be found in fields throughout the world as well as in your own particular locality. Seven different size units are manufactured to meet various field requirements.

MEDEARIS OIL WELL SUPPLY COMPANY

(formerly California Bettis Co.) has for many years been associated with the sale, distribution, and service of Rotary Mud Shakers, Casing Protectors and Stabilizers and Rotary Chains. A complete repair shop is maintained in South Gate, with Field Service and Local Warehouse Stocks in principal fields.

Phone or Write for a JENSEN BULLETIN, or ask your Supply Dealer for one.

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South Gate, Calif.

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Venice Discovery Well Abandoned by Ohio Oil

Oil men with long memories last week noted with varied emotions the abandonment of Recreation Gun Club No. 1 by the Ohio Oil Co. To some the well ushered in a new era of prosperity, to others a period of good business while to many more it was only a forerunner of severe headache. In 1928, the Ohio Oil Co. began a thorough study of the Venice shore area which culminated a year later with the drilling of two prospect wells. The first encountered sufficient showings to require the drilling of the second which was located on the Gun Club lease south of Washington Blvd. and east of the Canal. Oil sands were cored in this well at approximately 3800 ft., but as the science of formation testing was only in its infancy no test was made and the hole was carried down to the chist basement at 6199 ft. Somewhat to the surprise of the operators, the overlaying conglomerate appeared to contain fair oil saturation. Being before the days of gun perforating, it was necessary to plug the hole to the upper sand and set a string of casing above in order to determine its possibilities before setting pipe over the lower showing. On production test small quantities of low gravity oil were recovered from the upper sand so this horizon was cased off with a new string set in the nodular shale above the conglomerate. After cleaning out to bottom water was thought to be entering the hole so fresh water was circulated before running a locating instrument. This lightening of the mud fluid was all that was needed to bring in the discovery well of the first of the coastline fields whose reservoir rock is the now familiar fractured schist and schist conglomerate and whose cap rock is the nodular Miocene shale. Almost overnight scores of rigs sprang up taxing the ingenuity of engineers to get complete equipment on the tiny beach lot leases. Overdrilling together with the fact that the two producing horizons were relatively thin and contained no great amount of gas, combined to doom the field to early unimportance. Save for the Del Rey extention boom of three years ago, very little activity has taken place since the original campaign of eight years ago and the discovery well's abandonment is just a symbol of a fading field.

Ohio to Drill In El Segundo

Ohio Oil Co., one of the most successful El Segundo operators, has filed the first notice of intention to drill in the field for the year. Second only to Wilmington in 1937 during which 45 wells were completed, activity has lately declined to nearly zero. Ohio's new project is located on the Gough property and is the twelfth to be drilled by the company.

The Termo Co., Termo-Elsie No. 2, located in the northwest townlot district, which was bottomed at 7400 ft., has been put on he gas lift with mediocre results. Although a small flow of oil is obtained, the well heads badly and seems unable to maintain a steady rate.

Wilsire Oil Co. finally recovered the troublesome fish from El Segundo Construction No. 1 and after testing the conglomerate at 7407 ft., plugged to a shallow depth to redrill in an attempt to locate production by directional drilling.

Sovereign Oil Co. cored 10 ft. of conglomerate to the top of the schist at 7180 ft. and is preparing to test for production from the total depth of 7347 ft.

Recent completions in the field have shown an alarming rate of decline. Refinery No. 8 of the Standard Oil Co. has dropped from 1800 bbls. of clean oil to 825 bbls. cutting 20%, Ohio's Gough No. 11, whose initial was 715 bbls. is now only 150 bbls. Both are gas lift wells.

A NEW MacCLATCHIE TOOL!

THE FAMOUS QUICK UNION
NOW MADE WITH A SWIVEL CONNECTION!

At the request of cementing companies and other prominent users, the world-famous MacClatchie Quick Union is now available with a built-in ball bearing swivel connection. Double rows of ball bearings allow free swivelling and full 360 degree rotation, and assure long life under the most severe conditions. An Alemite fitting provides easy positive lubrication.

This new swivel adds still greater convenience to the field-proven efficiency of the MacClatchie Quick Union. On circulating and cementing operations, on loading racks, and in other drilling and refining applications, this new swivel-union adds speed and convenience. Hoses connected into it will not kink or twist, and pipe connections can be moved up or down without loosening threads.

The Quick Union Swivel is interchangeable with all MacClatchie Quick Unions now in use. It is extremely compact, having a length only 3" greater than the standard Quick Union. This feature makes it particularly desirable for cement head manifolds and other applications where hook-ups must be compact.

Write today for detailed information!

MacCLATCHIE MANUFACTURING CO.
COMPTON, CALIF. HOUSTON, TEXAS
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Just Say---

YES! You may send me the CALIFORNIA OIL WORLD for one year, for which I enclose $1.00.

For Foreign Countries, $2.00

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READY for LIFE

in steady pumping

THE BIRTH OF PLUNGERS AS SEEN BY AXELSON'S CANDID CAMERA . . .

Countless thousands of strokes — plunger against liner, metal to metal, week after week, for months. That's the kind of treatment to which Axelson plungers are subjected and for which they are fitted.

Manufactured from the finest materials under the guidance of one of the ablest engineering staffs in modern industry, Axelson plungers meet any pumping condition.

Axelson plungers are working longer in the bottom of more wells than any other plungers made.

After a thorough cleansing in vapor de-greasing machines, Axelson plungers are completely protected by the application of a rust-preventive solution.

Material for Axelson plungers is cut to proper lengths by power hack saws. These lengths are then ready for preliminary heat treatment.

Next, plunger blanks are packed in special containers with carburizing material and then sealed. This operation impregnates surface of plunger blanks with carbon.

Random samples of carburized plunger stock are checked for case depth to predetermined Axelson specifications. This is but one of a series of tests.

First machining operation in the manufacture of Axelson Super-Service Hardened Steel Plungers is the cutting of the grooves. Grooves are checked for depth.

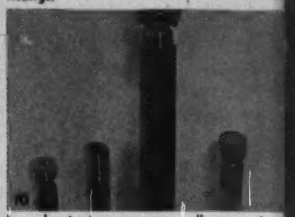
Carburized surface in ends of plungers is removed by boring. This is done to prevent hardening of the subsequently machined threads.

After these preliminary machining operations, plungers are returned to heat-treating department where hardened surface is produced by heating and quenching.

Plungers are again heated and drawn to relieve internal strains. The drawing operation consists of reheating and cooling at a predetermined temperature.

To insure proper operating surface hardness, each Axelson plunger is carefully checked in a Rockwell hardness testing machine.

Plungers are then returned to machining department where both ends are finish-reamed and threaded to receive plunger fittings.



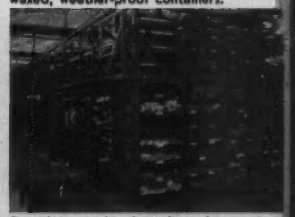
In order to insure proper adherence to A.P.I. specifications, plunger threads are checked with Go and No-Go thread gauges.

Surfaces of Axelson plungers are accurately finished to correct diameter by grinding. Tolerances are held to within one-quarter thousandth of an inch.

Mirror-finished polish is imparted to Axelson plungers by specially designed machines. This high polish permits smooth action and provides long life.

In the final inspection, Axelson plungers are rigidly checked for surface finish, straightness, concentricity and conformity to size and A.P.I. tolerances.

To avoid the possibility of corrosion induced by handling and exposure, Axelson plungers are immediately packaged in waxed, weather-proof containers.



Complete stocks of Axelson plungers insure rapid service to the industry. Extreme care is exercised in the storage of Axelson plungers.

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DEEP WELL PLUNGER PUMPS

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SAN JOAQUIN VALLEY WILDCATS

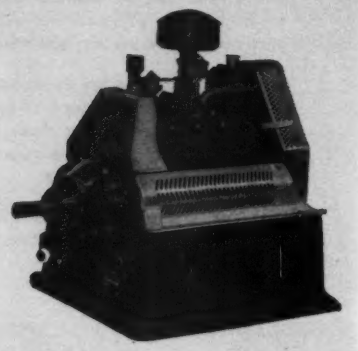
Area	Well	No.	Section	Depth	Status
Fresno County					
Coalinga	Conlon, J. M.	1	25, 19-14	100	Idle
	Petroleum Sec., Gatchell	2	18, 20-16	6675	Drilling
	Shell Oil Co.	36–1	36, 19-14		Rig
	Conlon	1	30, 19-15	3125	Drilling
	Sec. One	1	35, 20-14	150	Drilling
E. Coalinga	Pure Oil Co., SPL	1	31, 18-17	10785	Drilling
Ciervo	Superior Oil Co., C.U.P.	1	20, 16-13	6001	Drilling
Clovis	Central Valley Oil Co.	1	1, 12-20	511	Idle
Jacalitos Hills	Jacalitos Pet. Co.	1	14, 21-15	5745	Idle
Kern County					
Arvin	General Pet. Co., Pauley	1	22, 31-29	500	Idle
	Petrex, Inc.	1	32, 31-30	3625	Fishing
	Union Oil Co., Berry	1	15, 31-29	5450	Drilling
Belridge	General Pet., St. Helena	1	12, 28-20	8416	Drilling
	Ohio Oil Co., Ford	1	6, 29-22	3050	Drilling
	Shell Oil Co., Voight	1	32, 27-20	2615	Drilling
Buena Vista	Ohio Oil Co., KCL	A–8	32, 31-26	8875	Drilling
Devils Den	Amerada Pet. Co., Beer	5	22, 26-19	7075	Drilling
	Gibson Oil Co., Alferitz	3	14, 25-18	135	Drilling
	Little Major Oil Co.	1	36, 25-18	250	Idle
Dominion	Dean, Geo. W.	1	26, 26-28		Rig
Edison	British Cons. Oil Co.	1	11, 30-30	100	Drilling
	Johnson, G.W. Brown-Paulette	1	33, 29-30	1027	Idle
	Stevens, Ray	1	22, 30-30		Rig
	Wood, Callahan, Porter	1	20, 30-29	4010	Drilling
Fruitvale	Shell Oil Co. KCL	A-58	29, 29-27	6375	Drilling
Grapevine	Richfield Oil Corp.	KCL-1	28, 11-20		Rigging up
	The Petrol Corp.	32–2	32, 11-19	6020	Abandoned
	Universal Cons. Oil Co.	1	33, 11-19	4990	Plug
Greeley	Continental Oil Co. KCL	D-1	10, 30-26	8465	Drilling
	Shell Oil Co. KCL	1B-76	16, 29-26	5810	Drilling
	Superior Oil Co.	KCL-9	3, 30-26	7870	Abandoned
Lerdo	Standard Oil Co. KCL	18-1	29, 28-26	5120	Drilling
McFarland	Tidewater Assoc. O. Co., Pond	1	17, 26-25		Location
Poso Creek	Garven & Reynolds	1	30, 27-27		Rig
	Harkness & Laws, Hunt	1	28, 27-27		Foundation
Richgrove	Amerada Pet. Corp.	1	2, 25-27		Location
San Emigdio	Shell Oil Co. KCL	4-26	26, 11-22	7685	Drilling
Temblor Hills	Chico Martinez-Exeter	2	1, 29-20	1066	Cleaning out
Wasco	Continental Oil Co. KCL	A-2	8, 27-24	14418	Drilling
	Standard Oil Co., Randolph	2	14, 27-23	9537	Plug 7630—Testing
Kings County					
Pyramid Hills	Pyramid Prod. Co., Retherford	1	27, 24-18	3090	Idle
Kettleman	Temblor Oil Co., Bunting	1	25, 23-18	9138	Plug 7815—Idle
Tulare County					
Ducor	Crusaders Oil Co.	1	1, 24-27	57	Idle

NORTHERN COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Glenn	Ohio Oil Co., Willard	2	18, 20-2		Rigging up
Humboldt	The Texas Co., Eureka	2	22, 3-1	7708	Plug 6473-Shut in
Monterey	Anderson, A. A., Hillman	1	15, 24-14	4005	Idle
	Elba Oil Co.	1	6, 13-2	409	Idle
San Joaquin	Standard Oil Co., Weyl Zuckerman	2	25, 2-4	8810	Plug 5279—Testing
San Mateo	Wilshire Oil Co., Cowell	1	20, 6-5	8007	Plugging
Solano	Amerada Pet. Co., Mayhood	1	36, 4-2	3150	Drilling
	Richfield Oil Co., Potrero	1	10, 4-1		Grade
Sutter	Buttes Oil Fields, Ltd.	3	2, 15-1	6954	Completing as gas well

The Ensign Carburetor Co., Ltd., Los Angeles, Chicago, and Dallas, will exhibit gas, combination gas and gasoline, and butane carburetors and equipment in Booth No 42, California Building, at the International Petroleum Exposition, Tulsa, May 14th to 21st. Gilbert Woodill, sales manager and L. C. Arter, Dallas branch manager, will be in attendance. Several makes of engines operating on butane in the outdoor exhibits will have Ensign Carburetor equipment.

Bardco Power Unit



Introduction of a new power unit for operators of compressors, pumps, hoists, welders, pump-jacks and other oil field and refinery equipment is made by the Bardco Corp. of America, Los Angeles.

The manufacturer states that power is produced by this new unit as low as one-third of a cent per h.p. hour.

The unit is designed with unusual compactness for either stationary or portable service. Choice may be had of Ford V-8 engines or Diesel engines, and of fuel, natural or artificial gas, gasoline, distillate, butane or diesel fuel.

Special features include the oversize oil re-refining unit which saves oil drains eliminating carbon, excess dilution and acid, and the completely automatic safety controls which protect the equipment from low oil and water supply. In case of danger, the engine is stopped by the safety controls and they can be set to give a warning signal at any predetermined point.

Write Bardco Corporation of America, 6670 Lexington Ave., Los Angeles, for new Bulletin B-20 which completely describes the Bardco Power Unit.

Linerless Gravel-pack Is Proving Success

General Petroleum Corp. has just completed Ferguson No. 3 in the Rincon field in an interesting and unusual manner. No perforated casing was used but instead the hole itself was packed with "gravel" using ⅛-in. pellets from bottom, 3115 ft., to 2990 ft., then enlarging the diameter to ¾-in. for the balance of the fill to 2985 ft., a total of 50 ft. inside the water string which is set at 3035 ft. That the method is at least partially successful is shown in the present production of the well which is 145 bbls. of 30 gravity oil cutting 1.5%.

California Crude Oil Production

For Two Weeks Ending March 14, 1938

Field	March Daily Quota	Average Daily Production	Excess
San Joaquin Valley			
Belridge—North	17,315	15,363	*1,952
Belridge—South	1,915	1,597	*318
Buena Vista	18,275	19,580	1,305
Canal	1,250	1,280	*30
Coalinga—East-West	16,770	11,336	*5,434
Coffee Canyon	3,795	4,157	362
Edison	3,180	3,725	545
Elk Hills	8,725	11,116	2,391
Fruitvale	8,020	9,313	1,293
Greeley	4,045	3,539	*506
Kern Front	9,795	9,714	*81
Kern River	5,275	2,416	*2,859
Kettleman No. Dome	81,355	82,587	1,182
Lost Hills	4,800	3,786	*1,014
McKittrick	3,785	4,164	379
Midway	48,790	56,526	7,766
Mount Poso	17,025	20,458	3,433
Mountain View	12,460	12,989	529
Rio Bravo	450	645	195
Round Mountain	11,210	13,501	2,291
Ten Section	5,160	5,053	*107
Other Fields	2,635	2,989	354
TOTAL	286,000	295,734	9,734
Coastal Counties			
Elwood	6,315	7,642	1,327
Rincon	2,915	3,893	978
Santa Maria	8,770	4,027	*4,743
Santa Maria Valley	10,000	8,857	*1,143
Santa Paula-Newhall	5,600	5,430	*170
Ventura Avenue	35,760	32,318	*3,442
Other Fields	6,630	6,918	288
TOTAL	75,990	69,085	*6,905
Los Angeles Basin			
Alamitos-Seal Beach	9,005	9,491	486
Brea-Olinda	8,945	6,375	*2,570
Coyote—East	3,080	3,942	862
Coyote—West	9,375	9,033	*342
Dominguez	25,780	29,889	4,109
El Segundo	11,425	18,290	6,865
Huntington Beach—New	15,850	19,798	3,948
Huntington Beach—Old	14,680	15,358	678
Inglewood	16,090	16,469	379
Long Beach	80,645	87,650	7,005
Montebello-Extension	7,910	8,544	634
Playa del Rey	6,935	6,923	*12
Richfield	8,780	8,047	*733
Rosecrans-Athens	3,235	5,795	2,560
Santa Fe Springs	34,570	39,185	4,615
Torrance	7,090	7,583	493
Wilmington	57,185	100,631	43,446
Other Fields	2,480	2,129	*351
TOTAL	293,060	365,132	72,072
STATE TOTAL	655,050	729,951	74,901

*—Shortage.

Issue California Geology Quarterly

The Division of Mines, Department of Natural Resources, under the direction of Walter W. Bradley, state mineralogist, announces that the July, 1937 issue of "California Journal of Mines and Geology," comprising Chapter 3 of State Mineralogist's Report XXXIII is now ready for distribution.

The July quarterly has a report by R. J. Sampson, district mining engineer, on the mineral resources of Los Angeles county, accompanied by a map of the county, showing the location of the principal mines and oil fields. Important developments in the oil fields of the county are discussed by Emil Huguenin, deputy oil and gas supervisor, Los Angeles office, Division of Oil and Gas. The Geologic branch presents a paper by Gordon B. Oakeshott, professor of geology, Compton Junior College on the geology and mineral deposits of the western San Gabriel Mountains, Los Angeles county. The usual notes concerning statistics, museum, laboratory and library complete the issue.

The price of the July quarterly is 50 cents, which includes shipping charges and sales tax.

It may be obtained from the offices of the Division of Mines in San Francisco, Sacramento and Los Angeles; and consulted in the Redding branch office and in the offices of the Division of Oil and Gas in Bakersfield, Taft, Santa Barbara, Santa Paula and Coalinga.

State Drilling Report

Field	Company	Well	No.	Sec.	Twp.	Range
		NEW WELLS				
Wilmington	General Petroleum Corp.	Harbor Comm. 4, 8, 28, 29, 30, 31, 32, 33, 34, 35, 36 & 37	2	5S	13W	
	The Termo Co.	L. B. H. D.	D-4	3	5S	13W
		L. B. H. D.	D-3	3	5S	13W
	Kreiger Oil Co.		2	32	4S	13W
	Hogan Petroleum Co.	Graham	2	2	5S	13W
	James Michelin	Community	1	33	4S	13W
Ventura	Lloyd Corp., Ltd.	Lloyd Corp.	1	24	3N	23W
Santa Maria Valley	Union Oil Co.	Leroy	3	24	10N	35W
	California Lands, Inc.	Jones-Gallison	4	26	10N	34W
		MacDonnell	1	28	10N	34W
	Valoco Oil Co., Ltd.	Valoco	1	28	10N	33W
Belridge	Shell Oil Co.	Voigt One	1	32	27S	20E
	The Texas Co.	J. D. Martin	4	22	27S	20E
	Belridge Oil Co.		5-27	27	27S	20E
	Tidewater Assoc. Oil Co.		3 & 22	21	27S	20E
Round Mountain	Calif. Western Oil Co., Ltd.		11	12	28S	28E
	Harry Long	Willis	2	2	28S	28E
	Shell Oil Co.	Olcese Five	1	22	28S	29E
Greeley	Shell Oil Co.	KCL 1-B	76-16	16	29S	26E
	Standard Oil Co.	K.C. 11	14	18	29S	26E
Kettleman North	K. N. D. A.		27 & 58	16	22S	18E
	K. N. D. A.		27	22	22S	18E
	K. N. D. A.		43	20	22S	18E
	Standard Oil Co.		74	7	22S	18E
Coalinga	Shell Oil Co.	Section One	1	35	20S	14E
Newhall	Barnsdall Oil Co.	Rancho San Francisco	3	26	4N	17W
Coyote Hills	Bartholomae Oil Corp.	Stern	6	22	3S	10W
	Burmah Oil Co.	Sloan	1	21	3S	9W
Long Beach	The Caminol Co., Ltd.	Dominguez	1-8	14	4S	13W
	A. S. Johnston Drilling Corp.		31	13	4S	13W
	Hilldon Oil Co.	Pool	1	13	4S	13W
Dominguez	Shell Oil Co.	Reyes	94	33	3S	13W
Lost Hills	Tidewater Assoc. Oil Co.	Williamson	10-B	11	26S	20E
Wheeler Ridge	Richfield Oil Corp.	K. C. L.	1	28	11N	20W
Kern Co.	George S. Bates	El Tejon	1-A	11	30S	30E
	Standard Oil Co.	K. C. 18	1	29	28S	26E
Ten Section	Shell Oil Co.	KCL-A	34-30	30	30S	26E
		KCL-B	25-30	30	30S	26E
Fruitvale	Pacific Oil & Gas Dev. Corp.	Giusti	2	14	29S	27E
Mt. Poso	W. P. W. Petroleum Co.	Packard	1	14	27S	28E
	Ring Oil Co., Ltd.	Bohen	4	32	26S	28E
Canal	Shell Oil Co.	Canal KCL-A	2-13	13	30S	25E
Rio Bravo	The Superior Oil Co.	Wagner	3	35	28S	25E
Rio Vista Gas	Amerada Petroleum Corp.	E. Mayhood	1	36	4N	2E
		DEEPEN OR REDRILL				
El Segundo	Gov't Drlg. & Gas Corp., Ltd.	Copinger-Wallace	2	12	3S	15W
	Union Oil Co.	El Segundo	2	18	3S	13W
Torrance	Roy K. Wilson	B & C	1	14	4S	14W
	C. C. M. O. Co.	Torrance	23	14	4S	14W
	Williams & Van Valkenburgh	Torrance	9	14	4S	14W
	Imp. Gypsum & Oil Corp.	De Witt	1	14	4S	14W
Wilmington	Brookline Oil Co.	Webb Comm.	1	32	4S	13W
Santa Fe Springs	The Texas Co.	Foix	5	6	3S	11W
Long Beach	The Texas Co.	Harlow-Kent	2	19	4S	12W
	Richfield Oil Corp.	Green	2	29	4S	12W
	Shell Oil Co.	Alamitos	25	29	4S	12W
Seal Beach	Tidewater Assoc. Oil Co.	Bryant	4	11	5S	12W
Huntington Beach	Standard Oil Co.	Huntington B	60	3	6S	11W
Dominguez	Union Oil Co.	Hellman	41	34	3S	13W
Midway	Standard Oil Co.		34	17	32S	24E
	Quality Oil Co.	W. P.	1	27	32S	23E
	Standard Oil Co.		113	27	31S	23E
	Vista Grande Oil Co.	Vista Grande	2-B	22	32S	24E
Mountain View	A. T. Jergins Trust	Wright-Bloemer	1	30	30S	29E
	The Texas Co.	Mateo Smith	4	14	30S	28E
	The Petrol Corp.	Di Giorgio	1	4	31S	29E
	General Petroleum Corp.	Brantley	1	14	30S	28E
Playa Del Rey	The Ohio Oil Co.	Block L	2	28	2S	15W
Richfield	J. A. Rhea	Koffend	5	28	3S	9W
Ventura	Shell Oil Co.	Edison	7	28	3N	23W
Elwood	Pacific Western Oil Corp.		92-2	16	4S	29W
	Barnsdall Oil Co.	Luton-Bell	15	15	4N	20W
	Honolulu Oil Corp.		90-9	15	4N	20W
Lost Hills	Standard Oil Co.	United	7	2	26S	20E
		ABANDON				
Playa Del Rey	The Ohio Oil Co.	Recreation Gun Club	1	21	2S	15W
San Bernardino Co.	Selegna Petroleum Corp.	Abacherli	3	12	3S	8W
Santa Fe Springs	Union Oil Co.	Bell	4	31	2S	11W
Midway	Jade Oil Co.	Jade	1, 2 & 3	15	32S	23E
Kern Co.	Ring Oil Co., Ltd.	K. C. L.	16-1	16	26S	28E
	The Petrol Corp.	Reserve-Petrol	32-2	32	11N	19W
Round Mountian	Richfield Oil Corp.	Olcese	1	17	28S	29E
Mountain View	Royalty Service Corp., Ltd.	San Joaquin	2	30	30S	29E
Edison	Westbrook Co.	Westbrook	1	4	30S	29E
Huntington Beach	Chas. B. Behr	Guaranty	1	10	6S	11W
Long Beach	Hilldon Oil Co.	Flood Control	1	11	4S	13W
Richfield	A. H. Joseph	Joseph-Wagner	1	29	3S	9W
Kings Co.	Carl W. Weller	Baby King	3	11	23S	16E

Summary	Week Ending March 19	Previous Week	To Date This Year	To Date Last Year
Total New Wells	28	20	260	277
Total Deepened or Redrilled	15	14	185	151
Total Abandoned	5	10	102	116

San Joaquin Valley

Superior Rio Bravo Proves Outstanding

Proving conclusively that the new Rio Bravo field is to be no flash in the pan, Superior Oil Co. brought in Wagner No. 1, a southeasterly offset to Union's discovery well, Kernco 34-1. Located in sec. 35, 28-25, the top of the oil sand was cored at 11,246 ft. and 7-in. casing cemented one foot lower at 11,247 ft. A production test was determined upon as the best means of testing the water shutoff and the hole was cleaned out to bottom, 11,265 ft. A few runs of the swab resulted in so large a flow that it was necessary to install a 9/64-in. bean in order to hold the production within the available means for handling. Through this small orifice the first gauge was at the rate of 800 bbls. daily of 38 gravity oil with 1,500,000 cu. ft. of wet gas. Flow pressure quickly built up to 2075 lbs. while casing pressure stabilized at 2100 lbs., a differential of only 25 lbs. Production from this 18 ft. interval being more than satisfactory, plans to deepen and case the lower portion of the hole were abandoned and the well is now considered a completed project, with present production running 588 bbls. of 40.3 gravity oil cutting 1.3%. The bean size has been slightly increased to 13/64 in.

Wagner No. 1 is noteworthy in many respects. Aside from being the second deepest producing well in the world, surpassed only by the discovery well's 11,302 ft., only 87 days were required from spudding Dec. 12 to completing Mar. 9, during which time 11¾-in. casing was cemented at 1995 ft. and 7-in. set over the oil sand. This record was made by using the latest and best of modern deep well drilling equipment including a 175-ft. steel derrick handling 120 ft. drill pipe stands. Of more importance to the Superior Oil Co. than mere records is the fact that the company's Kern county jinx has been broken. No company has prospected with the persistence with which Superior has endeavored to develop production in this richest of California's petroleum producing counties and no company has met with as discouraging results. To William "Bill" Keck, father of the company, Wagner No. 1 is more than just another excellent well at near record-breaking depth, drilled in far less time than any previous hole of like depth—Wagner No. 1 is a symbol of success, a reward for dogged determination to win and win big in an area where discoveries are difficult and costly but the compensations correspondingly great.

Lost Hills Shallow Pay Centering New Activity

Success of Argo Pet. Co. in developing shallow production at the north tip of Lost Hills has started a slight flurry of activity among other operators in the area. Randon Pet. Co. of San Francisco will drill in sec. 3, 26-20 and Bankers Oil of Bakersfield will drill in sec. 2. Near the north quarter corner of sec. 11 Tide Water Associated has spudded Williamson 10-B.

The Argo company, headed by Irvine Stewart, John Hurndall and Don Foggerty, all of Los Angeles, cored 20 ft. of good oil sand to bottom at 1289 ft. and cemented an 8⅝-in. water string at 1270. After running a perforated liner, the well started to flow, making approximately 50 bbls. per day while tubing was being run and a pump installed. Once on the bean, production was gauged at 75 bbls. 14.3 gravity oil cutting 15%. The well, known as Farnsworth No. 1-A is located near the east quarter of the southeast quarter of sec. 11, 26-20.

Texas Co. Theta No. 23 in sec. 2 drilled to 1842 ft. and plugged back to 1825 ft. to test sands cored below the shoe of the blank liner cemented at 1665 ft.

Midway Area Work Holds to High Level

The Midway area of Kern county, though one of the oldest major producing districts of the state, continues high in point of activity. In sec. 26, 32-23 Formax Oil Co. brought in well No. 22 pumping at the rate of 160 bbls. a day from total depth of 1795 ft. and despite considerable sand trouble, the well will doubtless make an excellent producer. In the same section W. C. (Bill) Van Fleet's new organization, Klamath Corporation, has announced plans for drilling in the near future. In the adjoining sec. 35, National Oil Co. is preparing to complete well No. 17 and has staked a location for No. 18. Signal Oil & Gas Co. has rig up for a fifth well on its sec. 35 Kendon lease. Standard Oil Co. carried well No. 35-23-D, sec. 23, 32-24, to 3817 ft. where a formation test indicated the bottom to be wet. Plugged to 3500 ft., a liner including 25 ft. of perforations was landed and the well brought in on the pump with production yet unestimated. Otis Hoyt completed another well, No. 9 on his Maricopa lease in sec. 7, 11-23. With 240 ft. open to bottom at 1520 ft., a flow of 85 bbls. cutting 20% was obtained on the air lift. Victor Oil Co.'s No. 14 in sec. 35, 32-23 is drilling below 3200 ft.

Shell Seeks Deep Zone Near Standard KCL 12-4

In what is believed to be a test of the Rio Bravo zone, Shell Oil Co. has spudded KCL 1-B 76 in sec. 16, 29-26. Located only half a mile east of Standard's No. 12-4 which found the Greeley shoreline sands wet, the well cannot normally expect production from that zone and must seek a new pay at lower levels.

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Many Locations Staked In Valley

Indicating that drilling activity for 1938 will maintain the rapid pace set in the past year, many new locations are being reported in the San Joaquin Valley.

At Coalinga, Shell Oil Co. has spudded in sec. 35, 20-14, while at Canal the same company is rigging up KCL A-81 in sec. 14, 30-25.

Tide Water Associated Oil Co. has announced plans for a wildcat to be known as Pond No. 1 in sec. 17, 26-25 west of McFarland. In the Richgrove area, Amerada Pet. Corp. has staked a location for an exploratory well in sec. 2, 25-27. Seaboard Oil Corp., inactive in California for the past several months, returns with the starting of a Mount Poso test, Glide No. 1 in sec. 7, 27-28.

Two new wells are scheduled for Kern Front, California Star's 5-80 in sec. 22, 28-27, and Spencer Petroleum's No. 1 in sec. 10, 28-27.

Ohio Oil Co. is grading for another Canal well, E-6 on KCL land in sec. 14, 30-25.

Randon Pet. Corp. has derrick erected for a north Lost Hills well, Theta No. 1, sec. 3, 26-20.

Standard Oil Co. is continuing its routine development program at Kettleman Hills with a new well on sec. 13, 21-16.

In the Midway-Sunset proven area, Texas Co. has foundations for well No. 31 on sec. 32, 32-24.

Standard 20,29-26 Flows 30 bbls. Hour

Several important developments have lately taken place in the Greeley field. Most encouraging is the completion of Calder-Klassen No. 1 by Standard Oil Co. in sec. 20, 29-26 from 70 ft. of sand flowing 230 bbls. of 35 gravity oil during an eight-hour test. This well was drilled to 7795 ft. and plugged to 7750 ft. when formation tests showed the lower sand section wet. Some difficulty was experienced in completing until the 9-in. casing was discovered to be worn through at 2100 ft. and a 6⅝-in. string was set with a packer at 7640 ft. Tubing was then run to 7730 ft. and sealed off against the 6⅝-in. casing with a packer at 7540 ft. The short production test was made using a one-inch bean and the fluid, which cut 10% water, was accompanied by 1,500,000 cu. ft. of gas. Now shut in, tubing pressure has built up to 1,560 pounds.

That the eastern field limit has been reached was further emphasized by the abandonment of two wells, KCL 12-4 in sec. 16, 29-26 and KCL 11-12 in sec. 20, 29-26. These wells found no oil in the Greeley sand.

Apparently precluding possibilities of extending the productive area to the south, Standard's Fleishauer Comm. No. 2, located near the center of the south half of sec. 20, cored the top of the sand at 7865 ft. but found it barren. The company is undecided whether to suspend or seek a lower horizon.

Standard Oil's Greeley bid for Rio Bravo zone production, KCL 11-2 in sec. 20, 29-26, is now making hole below 10,325 ft. after recovering a difficult fish from 10,300 ft. KCL 11-13 in the northwest quarter of the same section topped the oil sand at 7660 ft. and is testing 9-in. casing cemented at 7645 ft. preparatory to completing.

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Union Kerndo 34-2 Nearing Rio Bravo

Soon to reach the Rio Bravo sand is Union Oil Co.'s Kernco No. 34-2, one location northwest of No. 34-1 in sec. 34, 28-25. A 7-in. water string has been cemented on bottom at 11,200 ft. after which it is planned to penetrate the horizon and complete with perforated casing on bottom, unlike the field's first two wells which are producing "barefooted".

Four wells in sec. 35 are racing for the pay, with Superior Oil Co., Geissinger No. 1 having a distinct edge. Latest field reports give Geissinger No. 1, 11,137 ft.; Geo. F. Getty, Ramsey No. 1, 9,675 ft.; General Petroleum, Wagner No. 1, 9,350 ft., and Superior Wagner No. 2, 10,683 ft. In the same section, Superior has moved equipment from Wagner No. 1 and is spudding Wagner No. 3. Southeast of the wells grouped in the proven area, Superior is drilling Ruhl No. 1 below 10,950 ft. in sec. 1, 29-25.

Chiksan Announces Gulf Coast Office

Continually increasing sales of Chiksan Ball Bearing Swing Joints in the Gulf Coast territory have caused Chiksan Oil Tool Co., Ltd., Fullerton, Calif., to open an office in the Shell Building, Houston, Texas, P. O. Box 2144. Herb Maland, who has been Chiksan's chief engineer for a number of years, is in charge of the new office.

Thorough knowledge of the Chiksan Line and wide engineering experience enable him to make valuable recommendations for individual swing joint problems. He will devote the major portion of his time to promoting the use of Chiksan joints for boats, docks, refineries, loading racks and other low pressure Swing Joint installations.

Fresno Wildcat In Dry Temblor

Ciervo Unit Plan No. 1, joint test of C.C.M.O. and Superior Oil in sec. 20, 16-13, is the third important Fresno county wildcat to be abandoned by major operators in recent weeks. Drilled to 6001 ft., it is understood to have found the Temblor sands barren and now goes via the abandonment route following Union Oil Co.'s Nicholson No. 1 and Western Gulf's S. P. L. No. 4. A heavy butane-powered rig was used saving the expense of laying long gas lines or hauling fuel oil.

Superior Concludes Bellview Exploration

Writing what may be a final chapter to its Bellview exploratory campaign, Superior Oil Co. abandoned K.C.L. No. 9 in sec. 3, 30-26. Last October this well seemingly discovered a new valley floor field, when with bottom at 7605 ft. a formation tester was set at 7545 ft. and though open only 15 minutes, clean oil reached the surface and flowed at the rate of 2000 bbls. a day. The well was subsequently deepened to 7870 ft. where 7-in. casing was cemented and gun perforated in the interval previously tested. An initial 800 bbls. flow turned to mud and water within a few hours and all later efforts failed to result in more than a trace of oil. In the belief that an edge condition had been encountered, K.C.L. No. 10 was drilled to the southwest but was abandoned when no oil sand was encountered to 8403 ft. No. 9 was then plugged to a shallow depth and redrilled in the hope that careful coring and electrical logging could segregate the thin sand from the water-bearing strata known to exist above and below. When no oil sand whatever was encountered to the redrilled depth of 7800 ft., the well was given up as a lost cause and abandoned. Thus another near discovery takes its place with those of Western Gulf Oil Co. at Union Avenue in 1927 and Cantau Creek in 1937.

New Del Amo Sand Yields 251-Bbl. Well

Chas. W. Camp completed one of the best wells in the new Del Amo sand. Bottom was plugged from 5037 ft. to 5020 ft. where 6⅝-in. casing, including 115 feet of perforated was landed and cemented through perforations at 4900 ft. Present production is 251 bbls. daily, 27.0 gravity, 4.0%, with 26/64-in. bean, 125 pound flow pressure.

Belridge Oil 7 Flowing 550 Bbls.

Several completions have recently been made in the North Belridge field, latest of which is Belridge Oil's No. 7 in sec. 27, 27-20 which is flowing 550 bbls. of oil and 7,000,000 cu. ft. of gas. Eocene formations are open 450 ft. to bottom at 8465 ft. Reward Oil Co.'s No. 7, sec. 34, has now settled to 800 bbls. and 3,700,000 cu. ft. through a 16/64-in. orifice and Tide Water Associated's sec. 22 No. 2 is making only a little more oil and much less gas through a 96/64-in. bean. Texas Co., J. D. Martin No. 2, sec. 22, through a 6/64-in. bean, is flowing 300 bbls. a day with 1500 pounds tubing pressure.

Continental Wasco Drilling Below 14,418

Beginning to totter is the world's deepest well, Continental Oil Co., KCL A-2, now taking what may be the last core below 14,418 ft. Should the well be plugged back at this time it would certainly not be due to mechanical difficulties as even less trouble has been experienced on this job than on the average well of half its depth. Aside from a few hours lost when an electrical log was made to bottom at 14,270 ft., drilling has been continuous and free from delays of any kind. Formations run generally to gray shale with occasional sand streaks.

Strong gas showings are appearing at present depths.

Do you remember when, back in 1925, E. J. Miley's Athens No. 6 boosted the record to 7591 ft.?

Jacalitos May Abandon Test in Sec. 14, 21-15

Jacalitos Petroleum Co., Associated No. 1, sec. 14, 21-15, is now standing idle after the 5740-ft. hole was redrilled to 5674 ft. Showings noted during the original drilling turned out no better when re-cored and rumor has it that the well may soon be abandoned.

Union Deep Test Rosecrans Producer

Flowing at the rate of 52 bbls. per hour through a 56/64-in. bean, Union Oil Co.'s second deep zone well in the Rosecrans field was recently placed on production from the Miocene formation at 7630 ft.

Gravity of the oil was 31.4 degrees and the well made 900,000 cu. ft. of gas with casing pressure 675 pounds, and tubing pressure, 175 pounds. Cleaning up rapidly as it came in, the cut was down to 1% within 24 hours.

Location has been selected for the company's third deep zone well, Rosecrans 19, west of South Broadway and north of Rosecrans avenue.

Barnsdall Oil Co., whose success in this field has been conspicuous, is drilling O'Dea No. 20 below 6650 ft. in a hard shale formation. Only other active driller in the area is Universal Consolidated Oil Co.'s Trust No. 2, which is coring for a setting point at 7175 ft.

Depletion provisions of the new tax bill, which is now before the House, remain unchanged.

New Ideal Ajax

The new Ideal-Ajax 10x10½ Horizontal Twin Cylinder Roller Bearing Steam Engines are of the two-throw, center crank type with bored crosshead guides and with crank shaft running in tapered roller bearings. They are designed to run at moderate and high speeds and built for heavy duty, continuous service. They are compact and rugged, with fully enclosed frame and self-contained lubricating system, the manufacturers say.

Field tests have proven that direct acting steam slush pumps consume approximately two-thirds of the steam generated by the boiler on a conventional steam rig, it is claimed. Great savings in steam consumption, fuel and water can be obtained by using a 10x10½ Ideal Ajax Steam Engine in connection with an Ideal C-350 Power Slush Pump, for which this engine is particularly designed. When the engine is intended for driving a power pump, it usually is furnished without reversing mechanism, however, double throw eccentrics are provided, the same as furnished with reversing type engines, so that the engine can be easily changed into a reversing type engine for other power drive applications. This change can be done in the field and requires only a few new parts.

The pump drive engines are regularly furnished to run "Under" in order to give the proper rotation to the pump pinion shaft. The shaft is extended through both ends of the frame and the driving sheave or chain sprocket may be placed on either the right or left hand side.

Power pumps operated by the Ideal-Ajax Twin Cylinder Engines can be operated at any desired speeds and the engines will "stall" against a heavy overload which could be caused by a plugged bit or any restricted circulation. This feature is a pronounced advantage over an internal combustion engine or motor driven pump. To prevent an engine from overspeeding or running away, caused by a broken rotary hose or any other accident, the installation of an automatic, double cushioned combination throttle and engine stop valve is recommended. By means of a small, simple and positive shaft governor, which may be easily and quickly adjusted for any tripping speeds, the engine throttle is closed by a steam trip pilot valve. From remote points the valve may be independently tripped or closed by means of an emergency steam pipe connection, if desired.

Coastal District

Santa Maria Valley Maintains Position

Considering relatively adverse marketing conditions, Santa Maria Valley drilling activity is holding up very well. Completions in the past two weeks have been few, but with a score of operations now underway, there should be no appreciable lowering of the long term rate. Union Oil Co., controlling factor in the marketing situation, is also maintaining its dominating position in production, having recently completed a second well on the Frank Vicente lease in the west side section, pumping 1071 bbls. of 15.9 degrees gravity oil from a depth of 4986 ft. This yield is more than twice the output of the first Vicente well, located a quarter mile north.

Union has three other wells drilling in this field. O'Donnell No. 2-1, a mile and a half west of the Vicente lease on Black Road, is down 4935 ft. Two offsets to Le Roy No. 2, the field's western outpost, are drilling ahead—Silva No. 1 at 1560 ft. and Le Roy No. 3 at 758 ft.

Foundations are being poured for three more Union wells. Bradley Lands No. 3 is near the center of Sec. 25 in the prolific section of the original field; while Stinson No. 1 is a southerly offset to the Hobbs No. 6 producer in Sec. 28, on the west side of the field and a short distance east of the company's second Vicente well just completed.

California Lands, Inc., operating unit of Bank of America, is rapidly becoming one of the larger producers in the field, having three good wells on the Gallison property and a fourth drilling below 1538 ft. while McDonald No. 1, sec. 28, 10-34, is now at 2135 ft.

The combined operators, Bush and Hancock Oil companies, who with Union pioneered the field, obtained a good producer in the completion of Wylie No. 2 in sec. 25, 10-34. From a total depth of 4815 ft. plugged to 4650 ft. the well was pumped in at the rate of 500 bbls. of 14.5 gravity oil cutting only 1.0%. Brown No. 3 of the joint interests was last reported as coring brown shale showing oil at 4285 ft. after cementing 8⅝-in. casing at 3280 ft.

Section 27 continues to be the most active spot in the field. Geo. F. Getty, Inc., has built a derrick for Vicente No. 4; Hanoli Oil Co. is rigging up Holser No. 1; Walter Hughes, Munger No. 1 is drilling at 3350 ft.; F. E. Jones has foundations in for No. 2; Pacific Western Oil Co. Samarin No. 3 is testing 9-in. casing cemented at 4460 ft.; Palm Holding Co., Bill Jr. No. 2 is below 3300 ft.; Petroleum Equities Co., Weber No. 1 is preparing to core ahead after setting 8⅝-in. casing at 4030 ft.; and Signal Oil & Gas Co., Ramalho No. 3 is drilling below 4550 ft. York Oil Co. completed Doane No. 2 pumping and flowing 1500 bbls. cutting 2.0%. Bottomed at 4570 ft., the well was finished with water string set at 4220 ft. and a 7-in. perforated liner hung at 4565.

Bankline Wildcat Rushed in Sec. 7, 9-33

Bankline Oil Co. is rushing work on its Orcutt wildcat located in sec. 7, 9-33 on the Silva property. Derrick has been erected and unless inclement weather again interferes, drilling will be underway within a few days.

Moyle in Sec. 4, 8-32 Is 650-Bbl. Pumper

Moyle Pet. Co. has completed well No. 1, sec. 4, 8-32 at Gato Ridge, pumping at the estimated rate of 650 bbls. a day of heavy oil. Drilled to 3790 ft., 11¾-in. water string was cemented at 2165 ft. and 8⅝-in. perforated liner landed on bottom. Four-inch tubing with a gas anchor was run to approximately 2900 ft.

Bad Weather Halts Activity in Sespe Area

Operators in Ventura County's Sespe country are impatient over the long delays imposed upon them by old man weather who for the last 30 days has rendered practically all roads impassible. Characterized by extreme ruggedness, the Sespe district becomes virtually isolated during the rainy season due to washouts and inability of trucks to pull the heavy grades in wet weather.

Although operations are at a standstill, several new projects are awaiting better weather. Chief among them is that of Continental Oil Co. which will be a test of the Elkins property in sec. 23, 4-19. Although the well will be in the northeast quarter of the section, crews have not yet been able to survey the exact site. Section 32 Oil Co., newly organized by E. C. English and W. F. Leonard of Los Angeles, is waiting to start work on a test well in sec. 32, 5-19. In the same area La Salle & Van Dissen and Garmack Oil Co. are both unable to get equipment to locations selected last fall.

LAUGH THIS OFF

For the benefit of all amateur gardeners, **Bill Laury** declares the best way to kill gophers is to set three or four of these modern gopher traps where the animals can get a good look at them. They'll die laughing.

By the same token, a good way to get rid of cockroaches is to burn down the house.

And while we are giving out these household hints, we might as well add a few more: **Kinzie Miller,** for instance, suggests that if you want to keep visitors from dropping cigarette ashes on your office carpet, roll it up and put it in a closet somewhere.

Joe Dunn says you will have no trouble with a smoky chimney if you don't light the fire.

You can remove spots from any kind of fabric with a pair of scissors.

Also, never throw away blunted pen points. You can sell them to the post office.

Chas. McLaren now tells us they were going to hold a National Park week in the United States this year, but nobody could do it so they gave up the idea.

And did we ever tell you that a fire plug is an iron gadget that stands between two parked cars.

Ward Blackburn has developed statistics to prove that out of a thousand telephone calls you get the wrong number only five times, which shows that besides getting the wrong numbers we also get the wrong statistics.

He wisely remarks in addition, that if you really want to get on a line that isn't busy the best thing you can do is go fishing.

Jim Craig interrupts at this point to declaim that a psychic bid in bridge is exactly the same thing as ordering hash in a strange cafe.

According to **Roy Hoffman,** a couple of gasoline engineers had attended a banquet, and had not only discussed absorption but had tried it. As the evening wore on, the conversation became thicker and thicker, and the sensible remarks were fewer and fewer. Culminating one classic interlude was the following intelligent exchange:

1st P.E.: "Do you—hic—r'member **John Collins?"**

2nd P.E.: "Naw. Whassis name?"

1st P.E.: "Who's name?"

Which merely shows, as we have often said, that the reason some people find it so difficult to make both ends meet, is that they are too busy making one end drink.

"Did you ring for me, sir?" asked the waiter, and **Jack Schmid** replied, "No, I was tolling. I thought you had died."

And says **Doug Balthis** to the potter over on Los Feliz, "I don't remember your name, but your vase is familiar."

A chesty young rousty was holding forth no end in the doghouse regarding his athletic prowess. "Once," he proudly proclaimed, "I came within 6 seconds of a world record." There was silence for a moment, and then the derrick man enquired, "Was it in the hundred yard dash?"

Buck Weaver, erstwhile of Seattle and points north, has just been elected to the Board of Management of the Los Angeles Y.M.C.A. That's the first buckboard we've heard of in a long time.

Buck, by the way, is a bowler of no mean accomplishments. He probably learned all about strikes when he was up in Seattle.

As we near the end of another atrocious outburst, we are informed by **Percy Lea** that a Bakersfield oil man is planning to buy the house next door to him, and is now practising the saxophone so he will get a better price on it.

With which few remarks we leave you to struggle along by yourselves. Remember, an accident usually becomes more serious when compensation sets in. And that, as the firefly said at dawn, ends another illuminating session.

LOOK
for the BAKER SECTION in the
COMPOSITE CATALOG

One of the growing concerns serving the western oil industry is the Rapid Construction Co. Organized about the time of the 1929 depression, the company's policies of service have increased business each year.

Today the company ranks as one of the leaders in the fabrication and erection of steel storage, dehydrating, gasoline and compressor plants, and in pipe line construction work.

Many of the difficult erection jobs have been successfully handled by this company.

The executives of Rapid Construction Co. are: Frank E. Neary, president; Austin Sherman, vice president; W. W. Cameron, secretary; R. M. Hall, superintendent; R. H. Tecklenborg, sales manager; A. G. Babcock, Bakersfield manager and V. E. Louks, auditor. These men are widely known in the western oil industry.

Ring Mount Poso Pumping 225 Bbls.

Extending its run of good Mount Poso completions into the new year, Ring Oil Co. brought in Bowles No. 6, sec. 29, 26-28 from 1785 ft. pumping 225 bbls. a day. The company has rig up for Bohen No. 4 in sec. 32 and is preparing to recondition Louden No. 2.

Sales at filling stations in 1937 were 12 per cent above the previous year and 39 per cent above 1929, the U. S. Department of Commerce reports.

VERNON TOOL CO.

Vernon

PUMPING UNITS SET A NEW STANDARD IN ECONOMICAL PUMPING

LOW FIRST COST

Exceptionally long stroke, sealed roller bearings and highest-quality reduction gears—features usually found only on expensive units—are standard equipment on VERNON Pumping Units *which sell for less than ordinary types.*

LOW OPERATING COST

Perfect balance and a wide range of stroke lengths and speeds assure a smoothness of operation that materially reduces power, rod and tubing costs.

LOW MAINTENANCE COST

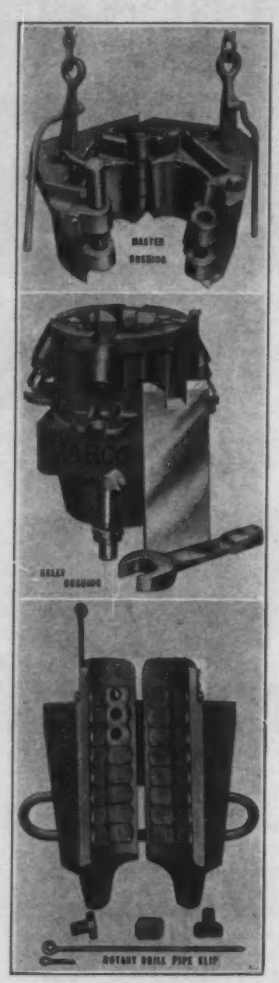
Advanced design and the use of highest-quality materials throughout, provide unusually low maintenance costs for VERNON Pumping Units even in the most severe oil field service.

Twin-Crank VERNON Pumping Units are available in 10,000, 15,000 and 22,000 pound A.P.I. ratings; Single Crank Units in 7500 and 10,000 pound ratings. Send for descriptive literature and prices.

VERNON TOOL CO., LTD.
2740 EAST 37TH STREET, LOS ANGELES, CALIF.

Abegg & Reinhold Co. Redesigns Three Units

Abegg & Reinhold Co., Ltd., 2533 East 26th St., Los Angeles, have completely re-designed three units in their line of equipment. These new units are built to meet the demand for modern deep well drilling. They are constructed of heat treated alloy steels of physical properties which meet all conditions with ample reserve strength to resist destruction and overcome wear.



The new Master Bushing eliminates need for building-up to compensate for wear and with different size bowl inserts the Rotary Slips can be extremely light in weight. This new Master Bushing is rigid and will add life to drill pipe by preventing crushing and slip cutting, as well as prolong the life of the rotary slips, the manufacturers say.

Any Kelly Bushing should naturally allow the Kelly to slide through its center without friction or interference. Without this important feature a basic part of the construction, any hold-up may cause a sudden drop which is ruinous to the core bit, drill, the wire line or the bearings on the table. This new Varco Kelly Bushing minimizes these possibilities. It is one solid piece of heat treated alloy steel capable of handling any undue stress and at the same time allowing free movement of the Kelly at all times. It houses inserts for both square and octagonal Kellys from 2½" to 6" inclusive; larger Kellys requiring larger bushings. Four powerful steel bolts of special design hold the inserts in place, which in turn force the liners into positive position, the pressure being taken over a large area. Within the bushing is a slight curvature which is an aid in aligning the inserts. These bushings last indefinitely, the inserts are replaceable and can be used from the same "pot" or bushing.

The new two-man lightweight rotary slip has as a basic feature inserts which are movably fastened, made of heat treated, chrome nickel steel. The unit is extremely light in weight, the body also being of alloy cast steel. The movably fastened inserts give an even grip over the entire circumference, all teeth being engagd. These inserts automatically adjust themselves and their replacement cost is very low.

The three new units working in combination have been used on many wells over 11,000 feet in depth. For additional information write to the manufacturer.

Freight rate increases ranging up to 10% on a wide variety of commodities were granted the railroads by the Interstate Commerce Commission on Mar. 8.

Officials and employes with their families enjoyed an excellent entertainment prepared by Al Leskin and Jack Manildi at the annual banquet of the Oil Well Supply Co., recently. Greetings of the company were extended to the members of the Oil Well Supply family by Byron Cleeland, assistant treasurer, and William H. Laury, sales manager.

Regan Hooks Magnafluxed

A new development in testing wigle type spring casing hooks is being introduced by the Regan Forge & Engineering Company of San Pedro, Calif. The hooks are now tested to one and one-half times their rated safe working load by a special machine built for the purpose.

A further inspection resorts to the use of a patented process, on which the company has secured a license. This inspection process, known as the Magnaflux system, is designed to show the positions and extent of any and all infinitesimal cracks which may exist, and which would be otherwise invisible to the naked eye. These cracks, if of negligible extent, are machined out so that they do not constitute a starting point for progressive fatigue failure. Otherwise, the hook is rejected. The test and inspection procedure is also being made available to any company with casing hooks already in service. These hooks may be sent to the plant for re-heat treatment and are then tested for cracks and load-carrying capacity.

California members of the A. P. I. 1938 Committee on Motor Fuel Research are J. R. MacGregor, Standard Oil Co. of California, and C. C. Moore, Union Oil Co. T. B. Rendell, Shell Petroleum Corp., has been named chairman of the committee.

LOS ANGELES BASIN WILDCATS

Los Angeles County

Area	Well	No.	Section	Depth	Status
Brea	Pressel, Perry, Tull	1	30, 2-9	4560	Idle
Castaic	Royal Land Corp.	1	8, 4-17	350	Drilling
La Morada	Carmenita Oil Co., Ravera	1	21, 3-11		Rigging up
Lomita	Kramer, Sebastian	1	25, 4-14		Rigging up
Monterey Park	Monte Cristo, Garvey	1	27, 1-2	4240	Idle
Mint Canyon	Christien, J. P.	1	7, 4-14		Rig
	Mint Canyon Oil Co.	1	33, 5-14	1860	Idle
Newhall	West Coast Dev. Co.	1	27, 4-16		Now Nat'l Pet. Corp.
	Barnsdall Oil Co., R.S.F.	3	26, 4-17	965	Drilling
	National Pet. Corp.	1	27, 4-16	1610	Drilling—Was West Coast Dev. Co.
Palmdale	Antelope Valley Pet.	1	17, 6-12	50	Tech. Spud.
Palos Verdes	Gene McLaren	1	27, 4-14	3992	Idle
	Hunter, Devlin et al	1	17, 4-14	5500	Plug 4500—Idle
	Rolling Hills Pet.	1	27, 4-14	4220	Idle
Pico	British Am. O. P. Co.	1	12, 2-12	3990	Idle
	A. S. Johnston, Univ. Cons., Pico	1	5, 2-11	4065	Drilling
Pico Canyon	Burt, A. G.	1	36, 4-17	2550	Idle
Towsley Canyon	Towsley Canyon Oil Co.	1	8, 3-16	4100	Pumping Oil and and Water
W. Long Beach	Pioneer Petrol Corp.	1	26, 4-13		Rigging up
Whittier	Fullerton Oil Co., Whittier	5	25, 2-11	150	Drilling
	Colorado Oil Co.	19	22, 2-11		Location

San Bernardino

Chino	So. Counties Pet. & Drlg. Co.	1	26, 2-8		Rig

COASTAL COUNTIES WILDCATS

Santa Barbara County

Area	Well	No.	Section	Depth	Status
Carpinteria	Carpinteria Oil Co.	1	32, 4-25	1850	Drilling
Cat Canyon	Standard Oil Co., Los Flores	1	27, 9-33	5530	Redrilling
Gaviota	Gaviota Oil Co., Hollister	1	35, 5-33	3205	Shut in-Gasser
	Wilshire Oil Co., Hollister	1	35, 5-33	2930	Drilling
Gato Ridge	Moyle Pet. Co.	1	4, 8-32	3795	Pumping
Orcutt	Bankline Oil Co., Silva	1	7, 9-33		Rig
Refugio	Tweedy, A. E., Penn.	1	34, 5-31	1700	Idle
Santa Rita	O. C. Field Gas Co., S.R.	1	11, 7-33	3360	Abandoning
Summerland	Gauthier Oil Co.	17-1	22, 4-26	1400	Drilling

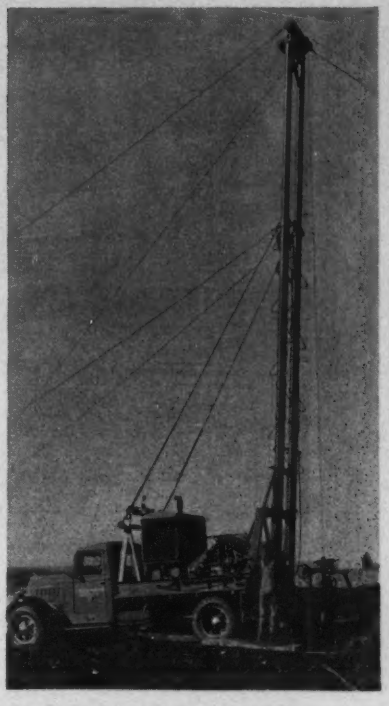
San Luis Obispo County

Edna	Loma Grande Oil Co., Lewis	1	28, 31-13		Rig
Elkhorn	Calif. Prod. Co.	1	6, 10-24	1550	Idle
	Western Plains Oil Corp.	1	7, 31-21	4010	Cleaning out
Paso Robles	Ajax Land & Dev. Co., Moss	1	27, 26-13	475	Idle
	Vanguard	1	14, 27-14	4360	Idle—Rains

Ventura County

Bardsdale	Little Canyon-Snodgrass	1	32, 4-19	1305	Idle
Camarillo	So. Calif. Drlg. Co., Daly	2	26, 2-21	3090	Idle
	The Texas Co., Edwards	1	19, 2-21	6111	Fishing
Oxnard	Oxnard Oil Co., Vanoni	1	10, 1-22	6302	Plug 6200—Idle
	Walter G. Rowe Johnson	1	15, 1-22	4135	Drilling
Ojai	High Mesa Oil Co.	1	16, 4-22	1301	Idle
Red Mountain	Arnett, Frank E.	3	15, 4-21	1167	Idle
Sespe	Commander Oil Co., Temescal	7-F	13, 4-18	215	Idle
	Condor	1	6, 4-19	2195	Idle
	Continental Oil Co., Elkins	1	23, 4-19		Grading roads
	Garmack Oil Co., Crosby	1	28, 5-19	565	Idle
		1	14, 4-19		Grade
	La Salle & Van Dissen	1	17, 5-19		Grade
	Speik Oil Co.	1	33, 5-19	3440	Rigging pump
	Terry, Geo., et al	1	23, 5-20	1340	Idle
	Williamson Oil Co.	1	1, 4-20	540	Idle
Simi	Trucano, Germanina	1	5, 2-17	1007	Idle
South Mt.	The Texas Co., Richardson	5	13, 3-21	2765	Drilling
	Clipper Oil Co., Scheiferle	1	17, 3-20		Rig material
Tar Creek	Section 20 Oil Co.	1	20, 5-19	1580	Idle
Timber Canyon	Stallings, Senter, Ahlberg	1	24, 4-21	675	Idle

Collapsible Mast



The new double collapsible mast-pole recently developed by Wilson Manufacturing Co., Wichita Falls, Tex., is designed to fill a long-needed oil-well servicing requirement, as it can handle wells 4,000 feet deep, equipped with 2½-inch A.P.I. tubing.

This mast is made of 6⅝-inch and 5 3/16-inch seamless pipe, and when extended to full height it is 50 feet high.

It easily can be raised over a well in 15 to 20 minutes, the manufacturers say. The mast is equipped with three special alloy steel sheaves running on heavy-duty Hyatt roller bearings, alemite-lubricated.

The new pole can be mounted on practically any type or size of Wilson winch now in use or on new winches purchased.

Suggested changes in derrick standards were considered by the A. P. I. California Subcommittees on the Standardization of Rigs and Derricks at a meeting in the offices of the California Oil and Gas Association on March 9.

Revenues of the manufactured and natural gas industry in 1937 amounted to $906,098,300, an increase of 4.3 % over $772,697,000 in 1936, according to the American Gas Assn.

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NEW MEXICO LEASEHOLDERS: For reliable information on New Mexico developments take my weekly scout report. W. S. Patterson, Santa Fe, N. M.

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IMPERIAL PIPE & SUPPLY CO., 2901 Santa Fe Ave., Los Angeles. JE. 1104. tf/b

LAND MAPS

Large loose-leaf atlas of Kern County township maps. Shows owners, leases, wells. 106 indexed pages in cloth-covered binder. Revised to Feb. 1, 1938. $125.00.
Old Geological Survey folios, bulletins & prof. papers on Santa Maria, Coalinga, McKittrick, Midway, Puente, Cuyama, San Luis, Mother Lode, Tertiary Pectens, many others. Send for price-list. Earl M. Price & Co., Bakersfield, Calif. 3-20-d

Although not included in the Interior Department appropriation bill as reported by the House Appropriation Committee, the House has approved the request of the U. S. Bureau of Mines for $7000 'for an additional survey of crude oil in storage."

Oil Men's Calendar

March

21-25—Western Metal Congress, Biltmore Hotel, Los Angeles.

21-22—St. Louis, Mo., Liquefied Petroleum Gas Association, annual meeting.

23-25—Los Angeles, Calif. American Society of Mechanical Engineers.

April

4-6—Cincinnati, Ohio, A.G.A. Distribution Conference, Netherland Plaza.

13-15—Houston, Tex., Petroleum Industry Electrical Association, Rice Hotel.

17-21—Dallas, Tex., American Chemical Society.

19—Los Angeles, Spring meeting, Pacific Coast, district, A.P.I. Division of Production, Biltmore Hotel.

20-22—Buffalo, N. Y., American Institute Mining and Metallurgical Engineers, Open Hearth Conference.

25-27—Hot Springs, Ark., Western Petroleum Refiners Association annual meeting.

28-29—Pittsburgh, Pa. Spring meeting, Eastern District, A.P.I. Division of Production, William Penn Hotel.

May

6-12—New Orleans, La. American Gas Association. Natural Gas Department.
11-13—Tulsa. Natural Gasoline Association, Hotel Tulsa.
12-14—Tulsa. National Oil Scouts Association of America.
14-21—Tulsa. International Petroleum Exposition.

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23-25 — A. P. I., Mid - Year Meeting, Wichita, Kansas.

June

6—Houston, Tex. Oil Workers International Union.
20-24—St. Louis, Mo. American Society of Mechanical Engineers.

September

14-16—Santa Barbara, Calif., annual meeting Pacific Coast Gas Association, Biltmore Hotel.

Passage of a Federal licensing bill (Borah-O'Mahoney bill) would reduce employment and retard recovery, Elmer T. Cunningham, acting chairman of the National Assn. of Manufacturers' committee, recently told a Senate Judiciary subcommittee.